

Western Calculator

W. Stearns

Subtraction Application

Application

1. Add $125 + 16 + 2060 + 800954 + 6$.

Ans. 80118011.

$$\begin{array}{r}
 125 \\
 23 \\
 16 \\
 2060 \\
 800954 \\
 6 \\
 \hline
 80118011 \\
 8011674 \\
 \hline
 80118011
 \end{array}$$

2. Add one hundred and twenty-nine, six hundred and fifty-four, eight thousand and seventy, ten thousand, and four millions. Ans. 40108853.

$$\begin{array}{r}
 129 \\
 654 \\
 8070 \\
 10000 \\
 400000 \\
 \hline
 40108853 \\
 40108824 \\
 \hline
 40108853
 \end{array}$$

3. If I have received 125 dollars from D, 286 from B, 29 from C, 672 from F, how much have I received from all four? Ans. 1112.

$$\begin{array}{r}
 125 \\
 286 \\
 29 \\
 672 \\
 \hline
 1112 \\
 787 \\
 \hline
 1112
 \end{array}$$

11. Bought 60 barrels of flour from one man for 480 dollars, 45 barrels from

another for 675 dollars, 220 from another for 2200 dollars, and 126 from another for 1386 dollars: how many barrels of flour had I, and how much did they cost me? Ans. 481 barrels, and cost 4711 dollars.

60	
75	
220	
126	
<hr/>	
481	480
	675
	<hr/>
	2200
	1386
	<hr/>
	4711
	<hr/>
	11261
	<hr/>
	4711

$$\begin{array}{r}
 1000000000 \\
 999999999 \\
 \hline
 000000001 \\
 1000000000 \\
 \hline
 1000000000
 \end{array}$$

1. W. Stearns

$$\begin{array}{r}
 2200 \\
 242000000000
 \end{array}$$

2

Multiplication Multiplication

$$\begin{array}{r}
 24655781 \\
 \times 3 \\
 \hline
 74057343 \\
 \hline
 24685781
 \end{array}$$

$$\begin{array}{r}
 1 \quad 246 \\
 \times 425 \\
 \hline
 1230 \\
 492 \\
 984 \\
 \hline
 104550
 \end{array}$$

$$\begin{array}{r}
 6 \\
 \times 2 \\
 \hline
 12 \\
 \hline
 6
 \end{array}$$

$$\begin{array}{r}
 2 \quad 425 \\
 \times 246 \\
 \hline
 2550 \\
 1700 \\
 850 \\
 \hline
 104550
 \end{array}$$

$$\begin{array}{r}
 6 \\
 \times 3 \\
 \hline
 18 \\
 \hline
 6
 \end{array}$$

$$\begin{array}{r}
 2345601 \\
 \times 234 \\
 \hline
 9382404 \\
 4036803 \\
 4691202 \\
 \hline
 548870634
 \end{array}$$

$$\begin{array}{r}
 3 \quad 5221 \\
 \times 145 \\
 \hline
 26105 \\
 20884 \\
 5221 \\
 \hline
 757045
 \end{array}$$

$$\begin{array}{r}
 1 \\
 \times 1 \\
 \hline
 1 \\
 \hline
 1
 \end{array}$$

$$\begin{array}{r}
 234 \quad 548870634 \quad 2345601 \\
 \times 468 \\
 \hline
 608 \\
 702 \\
 \hline
 1067 \\
 986 \\
 \hline
 1310 \\
 1170 \\
 \hline
 1406 \\
 1406 \\
 \hline
 023 \\
 000 \\
 \hline
 234 \\
 234 \\
 \hline
 548870634
 \end{array}$$

$$\begin{array}{r}
 4 \quad 23430 \\
 \times 230 \\
 \hline
 00000 \\
 70290 \\
 46860 \\
 \hline
 5388900
 \end{array}$$

$$\begin{array}{r}
 23430 \\
 \times 230 \\
 \hline
 00000 \\
 70290 \\
 46860 \\
 \hline
 5388900
 \end{array}$$

$$\begin{array}{r}
 00000 \\
 70290 \\
 46860 \\
 \hline
 5388900
 \end{array}$$

$$\begin{array}{r}
 68523047653 \\
 \times 2367 \\
 \hline
 479661333591 \\
 4111382859181 \\
 2055691429591 \\
 1370460953061 \\
 \hline
 162194053794651 \\
 14202 \\
 \hline
 20174 \\
 18936 \\
 \hline
 12380 \\
 11835 \\
 \hline
 5455 \\
 4734 \\
 \hline
 7213 \\
 7401 \\
 \hline
 11249 \\
 9068 \\
 \hline
 18114 \\
 16569 \\
 \hline
 11835 \\
 15406 \\
 \hline
 7101 \\
 14202 \\
 \hline
 7101
 \end{array}$$

$$\begin{array}{r}
 5 \quad 3800920 \\
 \times 80450 \\
 \hline
 0000000 \\
 19004600 \\
 26606440 \\
 0000000 \\
 30407360 \\
 \hline
 306924290000
 \end{array}$$

$$\begin{array}{r}
 8 \\
 \times 2 \\
 \hline
 16 \\
 \hline
 8
 \end{array}$$

$$\begin{array}{r}
 6 \quad 89534925 \\
 \times 435 \\
 \hline
 444584625 \\
 268610725 \\
 626458475 \\
 \hline
 65889639875
 \end{array}$$

$$\begin{array}{r}
 3 \\
 \times 6 \\
 \hline
 18 \\
 \hline
 3
 \end{array}$$

$$\begin{array}{r}
 12545 \\
 11835 \\
 7101 \\
 7101 \\
 \hline
 18114 \\
 16569 \\
 15406 \\
 14202
 \end{array}$$

$$\begin{array}{r}
 0 \\
 \times 0 \\
 \hline
 0 \\
 \hline
 0
 \end{array}$$

Multiplication Multiplication

$$\begin{array}{r}
 78965987 \\
 5893 \\
 \hline
 236897961 \\
 710698883 \\
 31427896 \\
 394829935 \\
 \hline
 465346861391
 \end{array}$$

$$\begin{array}{r}
 115 \\
 45 \\
 \hline
 575 \\
 805 \\
 \hline
 8625
 \end{array}$$

8. what will 45 bushels of wheat come to, at 1, 15 cents per bushel?

Ans. 86 dollars. 25 cents.

$$\begin{array}{r}
 115 \\
 45 \\
 \hline
 575 \\
 805 \\
 \hline
 8625
 \end{array}$$

9. bought 3950 lbs. of coffee. at 29 cents per lb. what must I pay.

Ans. 1145 dollars. 50 cents.

$$\begin{array}{r}
 3950 \\
 29 \\
 \hline
 35550 \\
 7900 \\
 \hline
 114550
 \end{array}$$

10. there are 12 pence in one shilling. how many are there in 40:

Ans. 480 pence

$$\begin{array}{r}
 40 \\
 12 \\
 \hline
 80 \\
 40 \\
 \hline
 480
 \end{array}$$

when the multiplier is the exact product of any two factors in the multiplication table.

Rule
Multiply the given sum by one of these: and that product multiplied by the other. will give the number required.

Examples

1. Multiply 4236 by 16.

$$\begin{array}{r}
 4236 \\
 4 \\
 \hline
 16944 \\
 4 \\
 \hline
 67776
 \end{array}$$

2. Multiply 871075 by 21. Ans. 18292575

$$\begin{array}{r}
 871075 \\
 21 \\
 \hline
 871075 \\
 1742150 \\
 \hline
 18292575
 \end{array}$$

$$\begin{array}{r}
 2453642 \\
 36 \\
 \hline
 14721852 \\
 7360926 \\
 \hline
 88331112
 \end{array}$$

$$\begin{array}{r}
 43102 \\
 64 \\
 \hline
 172408 \\
 258512 \\
 \hline
 2758528
 \end{array}$$

$$\begin{array}{r}
 23645 \\
 144 \\
 \hline
 94580 \\
 94580 \\
 23645 \\
 \hline
 3404880
 \end{array}$$

$$\begin{array}{r}
 12071 \\
 99 \\
 \hline
 108639 \\
 108639 \\
 \hline
 1195029
 \end{array}$$

1. Multiply 240 by 20. Ans. 4800

$$\begin{array}{r}
 240 \\
 20 \\
 \hline
 000 \\
 480 \\
 \hline
 4800
 \end{array}$$

$$\begin{array}{r}
 3600 \\
 400 \\
 \hline
 0000 \\
 0000 \\
 1440 \\
 \hline
 144000
 \end{array}$$

$$\begin{array}{r}
 550000 \\
 440000 \\
 \hline
 000000 \\
 000000 \\
 000000 \\
 000000 \\
 22000000 \\
 22000000 \\
 \hline
 242000000000
 \end{array}$$

Multiplication

h.

$$\begin{array}{r} 663000 \\ 60000 \\ \hline 000000 \\ 000000 \\ 000000 \\ 000000 \\ 3978000 \\ \hline 39780000000 \end{array}$$

1.

$$\begin{array}{r} 200 \\ 10 \\ \hline 000 \\ 200 \\ \hline 2000 \end{array}$$

2.

$$\begin{array}{r} 462 \\ 100 \\ \hline 000 \\ 000 \\ 462 \\ \hline 46200 \end{array}$$

$$\begin{array}{r} 1000 \\ 879 \\ \hline 9000 \\ 7000 \\ 8000 \\ \hline 879000 \end{array}$$

1. A gentleman owes 25 laborers 15 dollars each. how much does the whole come to? Ans. 375 dollars

$$\begin{array}{r} 25 \\ 15 \\ \hline 125 \\ 25 \\ \hline 375 \end{array}$$

2. A saddler owes his Journeyman for 43 days work. at 125 cents per day. how much does he owe him in all?

Ans. 53 dollars 75 cents

$$\begin{array}{r} 125 \\ 43 \\ \hline 375 \\ 500 \\ \hline 5375 \end{array}$$

3. A merchant buys 440 yards of muslin at 32 cents per yard. how much does the whole cost? Ans. 140 dollars 80 cents

$$\begin{array}{r} 440 \\ 32 \\ \hline 880 \\ 1320 \\ \hline 14080 \end{array}$$

Multiplication

11. A farmer sells 60 bushels of wheat at 125 cents per bushel; 60 bushels of rye at 85 cents; 30 of corn at 50 cents; how much is he to receive for each, and how much does the whole amount to?

Ans. 75.00 cents for the wheat. 31.00 cents for the rye 15.00 cents for the corn, and the whole amounts to 126.00 cents, or 126 dollars.

$$\begin{array}{r} 125 \\ 60 \\ \hline 000 \\ 750 \\ \hline 7500 \end{array}$$

$$\begin{array}{r} 85 \\ 40 \\ \hline 00 \\ 340 \\ \hline 3400 \end{array}$$

$$\begin{array}{r} 50 \\ 30 \\ \hline 00 \\ 150 \\ \hline 1500 \end{array}$$

$$\begin{array}{r} 7500 \\ 3400 \\ 1500 \\ \hline 12600 \\ 5100 \\ \hline 12600 \end{array}$$

5. A dollar is equal to 10 dimes, and 10 dimes are equal to 100 cents. how many dimes and cents are there in 100 dollars? Ans 1000 dimes, and 10000 cents

$$\begin{array}{r} 100 \\ 10 \\ \hline 000 \\ 160 \\ \hline 1000 \text{ dimes} \\ 10 \\ \hline 0000 \\ 10000 \end{array}$$

Multiplication Division

7. How many panes of glass are there in a house that has 32 windows, 20 of which have 24 lights each, and the rest have 18 each?

Ans. 696 panes

$$\begin{array}{r} 18 \\ 12 \overline{) 36} \\ 18 \\ \hline 216 \end{array} \quad \begin{array}{r} 24 \\ 20 \overline{) 480} \\ 400 \\ \hline 80 \end{array} \quad \begin{array}{r} 32 \\ 3 \overline{) 96} \\ 6 \\ \hline 32 \end{array}$$

$$\begin{array}{r} 180 \\ 216 \\ \hline 696 \\ 216 \\ \hline 696 \end{array}$$

8. A has 250 dollars, B has three times as many, and C has four times as many as B: how many dollars have B and C each, and how many have they altogether?

Ans. B has 750 dollars, C 3000 dollars, altogether 4000 dollars

$$\begin{array}{r} 250 \\ 3 \overline{) 750} \\ 750 \\ \hline 0 \end{array} \quad \begin{array}{r} 3 \\ 3 \overline{) 9000} \\ 9000 \\ \hline 0 \end{array}$$

$$\begin{array}{r} 750 \\ 4 \overline{) 3000} \\ 3000 \\ \hline 0 \end{array} \quad \begin{array}{r} 3 \\ 3 \overline{) 12000} \\ 12000 \\ \hline 0 \end{array}$$

$$\begin{array}{r} 250 \\ 750 \\ 3000 \\ \hline 4000 \end{array}$$

$$\begin{array}{r} 2) 46578238 \\ 23289119 \\ \hline 46578238 \end{array}$$

$$\begin{array}{r} 3) 672245139 \\ 224081413 \\ \hline 672245139 \end{array}$$

$$\begin{array}{r} 4) 4756394344 \\ 1189098586 \\ \hline 4756394344 \end{array}$$

$$\begin{array}{r} 5) 97036142 \\ 19407228 \\ \hline 97036142 \end{array}$$

$$\begin{array}{r} 2) 27846210 \\ 11930716 \\ \hline 27846210 \end{array}$$

$$\begin{array}{r} 12) 64381259 \\ 5365104 \\ \hline 64381259 \end{array}$$

$$\begin{array}{r} 6) 3824966 \\ 637494 \\ \hline 3824966 \end{array}$$

$$\begin{array}{r} 7) 46825486 \\ 6689355 \\ \hline 46825486 \end{array}$$

$$\begin{array}{r} 9) 8294463813 \\ 921940423 \\ \hline 8294463813 \end{array}$$

Division

examples

Dividend

Divis 112) 9840 (235
 24
 144
 126
 210
 210

1: 24) 9840 (411
 96
 24
 24
 30
 24
 6
 9840

2: 41) 94949 (2316
 82
 129
 123
 67
 41
 269
 226
 43
 94949

3 64) 24684624 (1638699
 256
 408
 384
 244
 192
 556
 512
 442
 384
 584
 516
 8
 24684624

Division

11:

11989536925 (65291886
 4410
 3889
 3645
 2145
 1470
 6453
 6145
 1386
 735
 6519
 5880
 6392
 5880
 5125
 4410
 715

11989536925

5: 2364) 4917968964 (2084468
 4768
 19896
 18842
 11248
 9436
 18129
 16518
 16166
 14134
 20124
 18842
 1255

6: 641) 5344608 (8009
 5368
 6608
 6089
 569

Division

Division

McMick, V
James B

$$\begin{array}{r}
 175296 \overline{) 19842412000} \quad 113195 \\
 \underline{175296} \\
 231311 \\
 \underline{175296} \\
 560152 \\
 \underline{525888} \\
 342610 \\
 \underline{175296} \\
 1648440 \\
 \underline{1574664} \\
 937860 \\
 \underline{876180} \\
 81280
 \end{array}$$

$$\begin{array}{r}
 8: 108 \overline{) 5401392} \quad 528 \\
 \underline{540} \\
 304 \\
 \underline{216} \\
 883 \\
 \underline{864} \\
 199 \\
 \underline{108} \\
 912 \\
 \underline{864} \\
 48 \\
 \underline{5401392}
 \end{array}$$

$$\begin{array}{r}
 42 \overline{) 9870} \quad 235 \\
 \underline{84} \\
 147 \\
 \underline{126} \\
 210 \\
 \underline{200} \\
 210 \\
 \underline{9870}
 \end{array}$$

$$\begin{array}{r}
 200 \overline{) 2564} \quad 12 \\
 \underline{200} \\
 564 \\
 \underline{400} \\
 164
 \end{array}$$

$$\begin{array}{r}
 600 \overline{) 84654} \quad 146 \\
 \underline{600} \\
 2465 \\
 \underline{2400} \\
 3654 \\
 \underline{3600} \\
 54
 \end{array}$$

$$\begin{array}{r}
 3: 80 \overline{) 28344} \quad 354 \\
 \underline{240} \\
 434 \\
 \underline{400} \\
 344 \\
 \underline{320} \\
 24
 \end{array}$$

$$28344$$

$$\begin{array}{r}
 4: 1600 \overline{) 134000} \quad 85 \\
 \underline{12800} \\
 9000 \\
 \underline{8000} \\
 1000
 \end{array}$$

$$134000$$

$$\begin{array}{r}
 10 \overline{) 5640} \quad 564 \\
 \underline{50} \\
 64 \\
 \underline{60} \\
 40 \\
 \underline{40}
 \end{array}$$

$$\begin{array}{r}
 100 \overline{) 25654} \quad 256 \\
 \underline{200} \\
 565 \\
 \underline{500} \\
 654 \\
 \underline{600} \\
 54
 \end{array}$$

$$\begin{array}{r}
 1000 \overline{) 846024} \quad 846 \\
 \underline{8000} \\
 4602 \\
 \underline{4000} \\
 6024 \\
 \underline{6000} \\
 24
 \end{array}$$

$$\begin{array}{r}
 10000 \overline{) 800000} \quad 80 \\
 \underline{80000} \\
 00000
 \end{array}$$

Federal Money

Examples of Addition

McConnick

Federal Money Book

1. $\begin{array}{r} \text{c} \quad \text{d} \quad \text{c} \quad \text{m} \\ 25.6.4.8.2 \\ 24.7.6.2.11 \\ 63.81.3.5 \\ 92.2.3.4.6 \\ \hline 206.11.5.8.7 \\ 180.8.1.0.5 \\ \hline 206.11.5.8.7 \end{array}$

$\begin{array}{r} \text{c} \quad \text{d} \quad \text{c} \quad \text{m} \\ 23.6.3.5.17 \\ \hline 3) 409.0.7.1 \\ \hline 23.6.3.5.7 \end{array}$

2. $\begin{array}{r} 5645.25 \\ 2386.63 \\ 2972.80 \\ 7285.45 \\ \hline 19320.43 \\ 13645.18 \\ \hline 19320.43 \end{array}$

$\begin{array}{r} 2634.25 \\ \hline 615828.50 \\ \hline 2634.25 \end{array}$

3. $\begin{array}{r} 53258.45 \frac{1}{4} \\ 93620.33 \frac{1}{2} \\ 31076.56 \frac{3}{4} \\ 27532.35 \\ \hline 205488.00 \frac{1}{2} \\ 152229.25 \frac{1}{4} \\ \hline 205488.00 \frac{1}{2} \end{array}$

$\begin{array}{r} 6348.75 \frac{1}{2} \\ \hline 957408.49 \frac{1}{2} \\ \hline 6348.75 \frac{1}{2} \end{array}$

4. $\begin{array}{r} \text{c} \quad \text{d} \quad \text{c} \quad \text{m} \\ 83.6.5.3.5 \\ 32.9.3.7.5 \\ \hline 116.5.9.0.0 \\ 32.9.3.7.5 \\ \hline 116.5.9.1.0 \end{array}$

$\begin{array}{r} \text{c} \quad \text{d} \quad \text{c} \quad \text{m} \\ 2) 63.3.8.6.2 \\ \hline 31.6.9.3.1 \\ \hline 63.3.8.6.2 \end{array}$

$\begin{array}{r} 5) 3632.45 \\ \hline 726.55 \\ \hline 3632.45 \end{array}$

5. $\begin{array}{r} 652980.25 \frac{1}{2} \\ 328763.31 \frac{1}{4} \\ 982443.56 \frac{3}{4} \\ \hline 328763.31 \frac{1}{4} \\ \hline 982443.56 \frac{3}{4} \end{array}$

$\begin{array}{r} 8) 82480.33 \\ \hline 10343.79 \frac{1}{2} \\ \hline 82480.33 \end{array}$

Federal Money Federal Money Money

Promiscuous questions.

1. Add 25 eagles, 62 dollars, 8 dimes, 15 cents, and 5 mills. Ans. 313d 55c 5m.

$$\begin{array}{r}
 \text{E} \quad \text{D} \quad \text{c} \quad \text{m} \\
 250000 \\
 62000 \\
 800 \\
 150 \\
 5 \\
 \hline
 313555
 \end{array}$$

2. A person deposited at bank 1055 dollars in notes 260 dollars in gold, 3650 dollars in silver and 25 cents how much is the amount. Ans. 4964d 50c

$$\begin{array}{r}
 \text{D} \quad \text{C} \\
 1055 \\
 260 \\
 3650 \\
 2.50 \\
 \hline
 4964.50
 \end{array}$$

3. Bought a barrel of sugar for 39 dollars and 84½ cents, a bag of coffee for 22 dollars 18¾ cents, and a pound of tea for 2 dollars 12½ cents; how much do they all cost? Ans. 64d 18¾c.

$$\begin{array}{r}
 \text{D} \quad \text{C} \\
 39.84\frac{1}{2} \\
 22.18\frac{3}{4} \\
 2.12\frac{1}{2} \\
 \hline
 64.18\frac{3}{4}
 \end{array}$$

4. Bought goods to the amount of 645 dollars 95¾ cents and paid at the time of purchase 350 dollars; how much remains to be paid.

Ans 295d

$$\begin{array}{r}
 \text{D} \quad \text{C} \\
 645.95\frac{3}{4} \\
 350.000 \\
 \hline
 295.95\frac{3}{4}
 \end{array}$$

5. A man lent his friend 1000 dollars, and received at sundry payments, first 160 dollars 25 cents, second 285 dollars 66½ cents, third 300 dollars 28¾ cents, what remains yet to be paid: —

$$\begin{array}{r}
 \text{Ans. } 253d 79\frac{3}{4}c. \\
 \text{D} \quad \text{C} \\
 1000. \\
 446.20\frac{1}{4} \\
 \hline
 253.79\frac{3}{4}
 \end{array}$$

6. What is the product of 102 dollars 19 cents multiplied by 120? Ans. 12262d 80c.

$$\begin{array}{r}
 102.19 \\
 \times 120 \\
 \hline
 00000 \\
 20438 \\
 10219 \\
 \hline
 1226280
 \end{array}$$

7. What will 16 barrel of flour amount to, at 4 dollars 50 cents per barrel: Ans. 72d

$$\begin{array}{r}
 450 \\
 16 \\
 \hline
 2400 \\
 450 \\
 \hline
 7200
 \end{array}$$

35

Federal Money James McGinnis

8. How much will 132 pieces of calico come to at 14 dollars 34½ cents a piece: Ans. 2293d 50c.

$$\begin{array}{r}
 1434\frac{1}{2} \\
 132 \\
 \hline
 3444 \\
 5211 \\
 1434 \\
 \hline
 66 \\
 \hline
 229350
 \end{array}$$

9. What is the quotient of 6022 dollars 50 cents divided by 5: Ans. 1204d 50c.

$$\begin{array}{r}
 5 \overline{) 6022.50} \\
 \underline{1204.50} \\
 6022.50
 \end{array}$$

10. A butcher bought 18 head of cattle for 252 dollars 90 cents. how much did he pay for each: Ans. 14d 05c.

$$\begin{array}{r}
 18 \overline{) 252.90} \\
 \underline{18} \\
 72 \\
 \underline{72} \\
 90 \\
 90
 \end{array}$$

11. bought 45 yards of linen for 22 dollars 50 cents. what is the price of one yard: Ans. 50 cents

$$\begin{array}{r}
 45 \overline{) 22.50} \\
 \underline{22.50}
 \end{array}$$

12. If 25 men expend 15555 dollars 50 cents in the erection of a bridge. how much has each one to pay, if the shares are equal: Ans. 622d 22c.

$$\begin{array}{r}
 25 \overline{) 15555.50} \\
 \underline{150} \\
 55 \\
 \underline{50} \\
 55 \\
 \underline{50} \\
 55 \\
 \underline{50} \\
 50 \\
 \underline{50}
 \end{array}$$

~~Having treated of Federal money separately.~~
 inasmuch as it requires to be well understood. Seeing it is the general currency in the united States. We now proceed to the other parts of mixed numbers: or as they are frequently termed. div's denominations.

Compound Addition

Compound Addition

Troy-Weight

~~1:~~

ll	oz	dwt	gr
12	20	24	
4	10	15	16
8	6	10	11
6	9	14	23
20	3	1	2
15	4	5	10
20	3	1	2

2

ll	oz	dwt	gr
12	20	24	
5	8	11	16
9	10	15	21
6	11	18	17
20	7	6	6
16	10	14	14
20	7	6	6

~~Troy-Weight~~

1: mistake

\$	20	12	
	5	8	
1256	11	8	
9462	8	4	
3215	10	6	
\$	13934	10	6

English Money

2

\$	20	12	4
	5	8	
35648	11	9	$\frac{1}{2}$
34562	18	4	$\frac{3}{4}$
68494	15	10	$\frac{1}{4}$
136439	6	3	$\frac{1}{2}$
101060	14	6	0
136439	6	3	$\frac{1}{2}$

3:

\$	20	12	4
	5	8	
2368	17	5	$\frac{1}{2}$
3964	19	11	$\frac{1}{4}$
9386	14	6	$\frac{3}{4}$
15425	11	11	$\frac{1}{2}$
18356	14	6	0
15425	11	11	$\frac{1}{2}$

~~Troy-Weight~~

This weight is used for
 sweets. gold. silver. and
 liquors the denominations
 are. pounds. ounces. penny
 weights. and grains.

Thus valued

24 grains (gr) make 1 penny
 weight.

20 pennyweights - 1 ounce - - 80

12 ounces - - - 1 pound \$.

3:

\$	20	12	4
	5	8	
4	5	17	11
9	6	12	9
18	11	19	23
33	0	9	19
28	6	12	8
33	0	9	19

Tavoireux Weight. OB/3

This weight is used for heavy articles generally and all metals but gold and silver.

The denominations are. Tons hundreds quarters.

pounds

ounces. and drams.

Thus valued.

16 drams. (dr) make	—	—	—	1 ounce	—	—	—	oz
16 ounces	—	—	—	—	—	—	—	—
28 pounds	—	—	—	—	—	—	—	lb
4 quarters (or 112 lb.)	—	—	—	—	—	—	—	qr
20 hundreds	—	—	—	—	—	—	—	cwt
	—	—	—	—	—	—	—	t

examples.

20. 11. 28.						
cwt	qr	lb	oz	dr		
10	16	2	24	9	12	
15	11	1	15	12	9	
85	8	3	19	13	13	
16	15	1	14	10	8	
130	21	1	18	14	10	
119	5	2	22	4	14	
130	21	1	18	14	10	

20. 11. 28. 16. 76						
cwt	qr	lb	oz	dr		
856	12	3	19	11	10	
534	19	1	23	8	9	
638	10	2	21	12	6	
884	19	3	24	14	15	
2921	3	0	9	2	8	
2064	10	0	17	6	11	
2921	3	0	9	2	8	

Compound Addition Book

Apothecaries' Weight.

Examples.

1: L	oz	dr	sc	gr		
17	5	7	2	14		
80	3	2	1	16		
85	10	3	2	5		
36	6	2	1	15		
2	20	2	0	2	10	
2	0	2	8	0	2	16
2	20	2	0	2	60	

2: L	oz	dr	sc	gr	
8	5	2	1	16	
3	11	7	2	19	
				12	
6	8	6	1		
5	2	4	2	9	
2	4	8	2	2	8
1	6	3	0	0	4
2	4	8	2	2	8

Cloth Measure: Cloth Measure: Cloth Measure

Examples

yd	ft	in	e. ft	in	e. ft	in	e. ft	in	e. ft	in	
56	2	2	80	2	3	16	4	2	53	3	
86	1	3	18	1	2	17	5	1	53	3	
33	3	2	36	2	2	80	2	2	32	2	
38	2	1	36	2	1	13	3	3	81	0	
<hr/>			<hr/>			<hr/>			<hr/>		
215	2	0	172	1	0	130	0	0	221	2	
158	3	2	91	2	1	112	3	2	167	1	
<hr/>			<hr/>			<hr/>			<hr/>		
215	2	0	172	1	0	130	0	0	221	2	
<hr/>			<hr/>			<hr/>			<hr/>		

James McCormick His Book

Compound Addition

Long Measure.
Examples.

deg	m	fur.	po.	yd	ft	in	lb	l.	m.	fur.	yd.	ft.	in.
50	30	5	15	2	2	9	2	5	2	6	15	2	11
60	25	7	12	4	1	10	1	3	1	4	9	1	9
45	35	2	9	2	2	8	1	2	1	3	15	2	8
20	55	6	8	1	1	1	2	1	2	5	200	1	6
223	3	5	6	10	4	0		13	2	3	167	2	10
169	4	7	80	3	2	0	6	7	2	5	91	2	11
223	3	5	6	10	4	0		13	2	3	167	2	10

Sand Measure. Sand Measure

Examples.

A.	u.	no.	A.	u.	no.	A.	u.	no.
r.	p.	r.	r.	p.	r.	r.	p.	p.
25	3	20	265	2	15	246	3	29
33	1	16	375	1	29	462	1	12
33	2	30	860	3	39	632	2	11
68	1	39	632	2	20	357	3	20
161	1	29	2134	2	23	1999	2	32
135	2	9	1869	0	48	1752	3	3
161	1	29	2134	2	23	1999	2	32

Compound Addition

Cubic, or solid Measure

1728:1728			1728 1728			1728:1728		
Cd	ft	in	T	ft	in	T	ft	in
4.	112	1260	6	39	1384	23	12	1400
6.	24	1500	2	26	526	68	45	6100
8.	127	1400	8	18	260	82	49	1400
5.	63	1103	3	12	1100	96	18	50
28.388.1404			19 96 1542			269.126.1294		
19 246 144			13 54 158			246.113.1622		
28 388 1404			19 96 1542			269 126.1294		

Time Examples

yr	mo	d	hr	mi	sec	yr	d	hr	mi	sec
22	10	25	16	34	55	1	350	15	19	5
34	6	16	20	48	33	2	268	13	54	38
46	9	23	23	59	59	6	350	22	50	50
104 10 3 13.23 27						14 240. 11. 4:33				
81 8 5 20 18 32						9 254. 12. 45. 28				
104 10 3 13 23 27						14 240. 11. 4:33				

Compound Addition

Motion

Examples

sig	³⁰ deg	⁶⁰ mi	⁶⁰ sec
2	24	48	58
2	27	59	59
3	31	20	20

9	16	9	17
---	----	---	----

6	21	20	19
---	----	----	----

9	16	9	17
---	----	---	----

~~2 24 48 58~~

sig	³⁰	⁶⁰	⁶⁰
3	20	30	40

2	25	35	45
---	----	----	----

3	26	38	58
---	----	----	----

10	12	45	23
----	----	----	----

6	22	14	43
---	----	----	----

10	12	45	23
----	----	----	----

Liquid Measure.

Examples

hhd	⁶³ gal	qt	pt	hhd	⁶³ gal
3	53	2	1	24	233
6	23	3	1	19	354
8	162	1	1	34	150

20	0	17	0	3
----	---	----	---	---

15	0	26	0	2
----	---	----	---	---

20	0	17	0	3
----	---	----	---	---

79	0	11
----	---	----

54	1	11
----	---	----

79	0	11
----	---	----

bu	⁴ qt
25	2 11
36	3 6
34	1 2
48	2 7
175	2 3
149	3 1
145	2 3

bu	⁴ qt
256	3 6
243	1 6
468	3 1
584	2 7
1543	3 4
1296	3 6
1553	3 4

bu	⁴ qt
34156	3 7
2003	1 2
950	8 6
4809	0 0
41920	0 7
7463	1 0
41920	0 7

of Compound Subtraction

Examples

$\text{\$}$ 20 12 11
 256 15 6 $\frac{1}{2}$
 129 12 8 $\frac{3}{4}$

124 2 9 $\frac{3}{4}$

256 15 6 $\frac{1}{2}$

20 4 28 16 16
 $\text{\$}$ cwt qrs ll oz
 246 15 2 18 11.5

89 16 1 24 8.15

156 19 0 22 2.6

246 15 2 18 11 5

8 40 16 $\frac{1}{2}$ 12 3
 mi fur p ft in lb
 250 4 24 10 6 1
 125 5 30 5 10 2
 124 5 34 11 4 2
 250 4 24 10 6 1

1 8 2
 bu p qt pt
 204 2 6 1
 150 3 2 0
 53 3 4 1
 204 2 6 1

2 11 60 60
 $\text{\$}$ h mi sec
 325 18 30 24
 236 20 45 50
 88 21 44 34
 325 18 30 24

4 63 8 2
 $\text{\$}$ hhd gal qt pt
 50 2 45 2 1
 20 3 60 3 0
 29 2 44 7 1
 50 2 15 2 1

30 60 60
 Sig Deg mi sec
 6 16 32 29
 3 24 16 48
 2 22 15 41
 6 16 32 29

4 30 $\frac{1}{4}$
 $\text{\$}$ r p
 16 58 . 2 . 16
 12 49 . 3 . 34
 4 08 . 2 . 12 $\frac{1}{4}$
 16 58 . 2 . 16

Compound Multiplication

Section 4.

$\text{\textit{S}}$	$\text{\textit{S}}$	$\text{\textit{d}}$	$\text{\textit{qrs}}$	$\text{\textit{S}}$	$\text{\textit{cwt}}$	$\text{\textit{qrs}}$	$\text{\textit{lb}}$	$\text{\textit{oz}}$	$\text{\textit{dr}}$
24	10	6	$\frac{1}{2}$	48	14	1	11	12	11
			2						3
$2) 49 \ 1 \ 1$				$3) 146 \ 2 \ 3 \ 14 \ 6 \ 1$					
$24 \ 10 \ 6 \ \frac{1}{2}$				$48 \ 14 \ 1 \ 11 \ 12 \ 11$					

$\text{\textit{lb}}$	$\text{\textit{oz}}$	$\text{\textit{dwt}}$	$\text{\textit{grs}}$	$\text{\textit{lb}}$	$\text{\textit{pec}}$	$\text{\textit{qt}}$
14	11	11	11	24	3	11
			5			8
$5) 41 \ 10 \ 17 \ 7$				$8) 199 \ 3 \ 0$		
$14 \ 11 \ 11 \ 11$				$24 \ 3 \ 7$		

$\text{\textit{hd}}$	$\text{\textit{gal}}$	$\text{\textit{qt}}$	$\text{\textit{pt}}$	$\text{\textit{dy}}$	$\text{\textit{m}}$	$\text{\textit{fur}}$	$\text{\textit{ro}}$	$\text{\textit{p}}$
25	18	3	1	8	24	6	34	8
			11					
$11) 283 \ 33 \ 2 \ 1$				$8) 6418 \ 6 \ 32$				
$25 \ 18 \ 3 \ 1$				$8 \ 24 \ 6 \ 34$				

$\text{\textit{yds}}$	$\text{\textit{ft}}$	$\text{\textit{in}}$	$\text{\textit{lb}}$	$\text{\textit{d}}$	$\text{\textit{h}}$	$\text{\textit{m}}$	$\text{\textit{sec}}$
24	2	8	2	89	3	26	9
			6				
$6) 144 \ 16 \ 11 \ 0$				$9) 809 \ 0 \ 34$			
$24 \ 2 \ 8 \ 2$				$89 \ 3 \ 26$			

$\text{\textit{lb}}$	$\text{\textit{pc}}$	$\text{\textit{qt}}$	$\text{\textit{d}}$	$\text{\textit{h}}$	$\text{\textit{m}}$	$\text{\textit{sec}}$	$\text{\textit{I}}$	$\text{\textit{m}}$	$\text{\textit{w}}$	$\text{\textit{d}}$
48	3	6	84	19	38	15	12	15	2	8
		11				9				3
$11) 538 \ 1 \ 2$			$9) 463 \ 8 \ 44 \ 15$				$12) 1832 \ 5 \ 324$			
$48 \ 3 \ 6$			$84 \ 19 \ 38 \ 15$				$152 \ 8 \ 34$			

149 3 7	584 2 7
145 2 3	1513 3 4
	1296 3 6
	1553 3 4

4 1 7
7
4 1 7

Compound Multiplication

Application

$\begin{array}{r} 20:12 \\ \text{£ } s \text{ d} \\ 2 \text{ } 6 \text{ } 4 \\ 5 \\ \hline 11 \text{ } 11 \text{ } 8 \end{array}$	$\begin{array}{r} 20 \text{ } 12 \text{ } 11 \\ \text{£ } s \text{ } 2 \text{ } q \text{ } r \\ 1 \text{ } 2 \text{ } 6 \frac{1}{4} \\ 9 \\ \hline 10 \text{ } 28 \frac{1}{4} \end{array}$	$\begin{array}{r} 20 \text{ } 12 \text{ } 11 \\ \text{£ } s \text{ } 2 \text{ } q \text{ } r \\ 12 \text{ } 9 \frac{1}{2} \\ 11 \\ \hline 4 \text{ } 0 \text{ } 8 \frac{1}{2} \end{array}$	$\begin{array}{r} 20 \text{ } 12 \text{ } 11 \\ \text{£ } s \text{ } 2 \text{ } q \text{ } r \\ 2 \text{ } 11 \text{ } 2 \frac{1}{2} \\ 12 \\ \hline 26 \text{ } 10 \text{ } 6 \\ 2 \text{ } 11 \text{ } 2 \frac{1}{2} \end{array}$
---	--	--	---

$\begin{array}{r} 20 \text{ } 12 \text{ } 11 \\ \text{£ } s \text{ } 2 \text{ } q \text{ } r \\ 12 \text{ } 8 \text{ } 6 \frac{1}{4} \\ 3 \\ \hline 37 \text{ } 5 \text{ } 6 \frac{3}{4} \\ 12 \text{ } 8 \text{ } 6 \frac{1}{2} \end{array}$	$\begin{array}{r} 20 \text{ } 12 \text{ } 11 \\ \text{£ } s \text{ } 2 \text{ } q \text{ } r \\ 12 \text{ } 8 \text{ } 6 \frac{1}{4} \\ 3 \\ \hline 37 \text{ } 5 \text{ } 6 \frac{3}{4} \\ 12 \text{ } 8 \text{ } 6 \frac{1}{2} \end{array}$	$\begin{array}{r} 20 \text{ } 12 \text{ } 11 \\ \text{£ } s \text{ } 2 \text{ } q \text{ } r \\ 12 \text{ } 8 \text{ } 6 \frac{1}{4} \\ 3 \\ \hline 37 \text{ } 5 \text{ } 6 \frac{3}{4} \\ 12 \text{ } 8 \text{ } 6 \frac{1}{2} \end{array}$	$\begin{array}{r} 20 \text{ } 12 \text{ } 11 \\ \text{£ } s \text{ } 2 \text{ } q \text{ } r \\ 12 \text{ } 8 \text{ } 6 \frac{1}{4} \\ 3 \\ \hline 37 \text{ } 5 \text{ } 6 \frac{3}{4} \\ 12 \text{ } 8 \text{ } 6 \frac{1}{2} \end{array}$
---	---	---	---

1. Multiply wt. 3 cwt. 1 qtr. 16 lb. 8 oz. 10 dr.
by 36. Ans. 150 t. 2 cwt. 1 qtr. 4 lb. 6 oz. 8 dr.

11	3	1	16	8	10
25	0	1	15	3	12
150	2	1	7	6	8

²⁰Compound Multiplicationⁿ

2: 120l. 6s. 9d. by 24. Ans. 2888l. 2s. 0d.

£	20	12
120	6	9
<hr/>		
422	0	6
<hr/>		
2888	2	0

$6 \times 4 = 24$

3: 2wt. 14wt 2gr. 7lb. by 48.
Ans. 1162t 19cwt. 0gr. 0lb.

24	11	2	7
<hr/>			
193	16	2	0
<hr/>			
1162	19	0	0

$8 \times 6 = 48$

Multiply 12 2 11 by 14

50	2	0	
<hr/>			
202	0	0	= 16
<hr/>			
12	2	11	= 1
<hr/>			
211	2	11	14

$11 \times 11 + 1 = 14$

CCC

Multiply 8d. 11h. 12mi. 5sec. by 29.

Ans. 237d. 1h. 50mi. 25sec

24	60	60	
8	11	12	5
<hr/>			
32	16	48	20
<hr/>			
228	21	38	20
<hr/>			
237	1	50	25

$4 \times 7 \times 1 = 29$

Compound Multiplication

21

$\begin{matrix} s & d & \text{by} \\ 2 & 6 & 245 \\ 10 \times 5 \end{matrix}$

15	0	0
10	0	0
12	10	0
25	0	0
5	0	0
12	6	
30	12	6

$\begin{matrix} s & d & \text{by} \\ 14 & 6 & 240 \\ 10 \times 0 \end{matrix}$

7	5	0
10	0	0
72	10	0
145	0	0
24	0	0
0	0	
174	0	0

$\begin{matrix} s & d & \text{by} \\ 1 \dots 2 \dots 3 & 117 \\ 10 \end{matrix}$

11	2	6
10	0	0
111	5	0
1	0	0
111	5	0
11	2	6
7	15	9
13	0	3

$\begin{matrix} s & d & \text{by} \\ 1 & 2 & 6 & 275 \\ 10 \times 5 \end{matrix}$

11	5	0
10	0	0
112	10	0
225	0	0
78	5	0
5	12	6
309	7	6

$\begin{matrix} 1 & 3 & 0 \dots 3 \dots 3 \\ 20 & 20 \end{matrix}$

2	6	03
12	12	
117	31	239
23	4	20
783	1	2
702	2	3
819		
819		

James McCormick

James McCormick

Compound Division

B

$$\begin{array}{r}
 \text{\text{£}} \quad \text{s} \quad \text{d. gr} \\
 2 \overline{) 465 \quad 10 \quad 6\frac{1}{2}} \\
 \underline{232 \quad 15 \quad 3\frac{1}{4}} \\
 465 \quad 10 \quad 6\frac{1}{2}
 \end{array}$$

$$\begin{array}{r}
 \text{cwt} \quad \text{qr} \quad \text{lb} \\
 6 \overline{) 91 \quad 16 \quad 1 \quad 14} \\
 \underline{15 \quad 6 \quad 0 \quad 5} \\
 91 \quad 16 \quad 1 \quad 14
 \end{array}$$

$$\begin{array}{r}
 \text{hd. gal. qt} \\
 8 \overline{) 468 \quad 1 \quad 48 \quad 3} \\
 \underline{58 \quad 2 \quad 13 \quad 3} \\
 468 \quad 1 \quad 48 \quad 3
 \end{array}$$

$$\begin{array}{r}
 \text{\text{£}} \quad \text{s} \quad \text{d. gr} \\
 3 \overline{) 563 \quad 15 \quad 4\frac{1}{2}} \\
 \underline{187 \quad 18 \quad 5\frac{1}{2}} \\
 563 \quad 15 \quad 4\frac{1}{2}
 \end{array}$$

$$\begin{array}{r}
 \text{yds} \quad \text{ft} \quad \text{in} \\
 5 \overline{) 960 \quad 1 \quad 9} \\
 \underline{192 \quad 0 \quad 5} \\
 960 \quad 1 \quad 9
 \end{array}$$

$$\begin{array}{r}
 \text{w} \quad \text{d} \quad \text{h} \quad \text{mi} \quad \text{sec} \\
 10 \overline{) 30 \quad 6 \quad 18 \quad 48 \quad 50} \\
 \underline{3 \quad 0 \quad 16 \quad 16 \quad 53} \\
 30 \quad 6 \quad 18 \quad 48 \quad 50
 \end{array}$$

examples

$$\begin{array}{r}
 \text{\text{£}} \quad \text{s} \quad \text{d} \\
 6 \overline{) 224 \quad 12 \quad 6} \text{ by } 30 = 6 \times 5 \\
 5 \overline{) 37 \quad 8 \quad 9} \\
 \underline{4 \quad 9 \quad 9} \\
 3 \quad 7 \quad 8 \quad 9 \\
 \underline{6} \\
 224 \quad 12 \quad 6
 \end{array}$$

$$\begin{array}{r}
 \text{\text{£}} \quad \text{s} \quad \text{d} \\
 11 \overline{) 134 \quad 18 \quad 8} \text{ by } 11 = 11 \times 11 \\
 4 \overline{) 12 \quad 5 \quad 11} \\
 \underline{3 \quad 1 \quad 11}
 \end{array}$$

$$\begin{array}{r}
 \text{\text{£}} \quad \text{s} \quad \text{d} \\
 12 \overline{) 984 \quad 0 \quad 0} \text{ by } 12 = 12 \times 12 \\
 12 \overline{) 82 \quad 0 \quad 0} \\
 \underline{6 \quad 16 \quad 8}
 \end{array}$$

$$\begin{array}{r}
 \text{\text{£}} \quad \text{s} \quad \text{d} \\
 9 \overline{) 444 \quad 0 \quad 0} \text{ by } 42 = 9 \times 8 \\
 8 \overline{) 52 \quad 13 \quad 11} \\
 \underline{6 \quad 11 \quad 8}
 \end{array}$$

Compound Division

23 35

$$\begin{array}{r}
 \text{L} \quad \text{S} \quad \text{d} \\
 25 \overline{) 264} \quad \overline{) 10} \quad \overline{) 7\frac{1}{2}} \\
 \underline{25} \quad \underline{10} \quad \underline{7\frac{1}{2}} \\
 14 \quad 0 \quad 0 \\
 20 \quad 0 \quad 0 \\
 \underline{290} \quad \underline{11} \quad \underline{10:11:7:\frac{1}{2}} \\
 25 \quad 0 \quad 0 \\
 40 \quad 0 \quad 0 \\
 25 \quad 0 \quad 0 \\
 15 \quad 0 \quad 0 \\
 12 \quad 0 \quad 0 \\
 184 \quad 0 \quad 0 \\
 175 \quad 0 \quad 0 \\
 \underline{12} \quad 0 \quad 0 \\
 4 \quad 0 \quad 0 \\
 50 \quad 0 \quad 0 \\
 50 \quad 0 \quad 0 \\
 \underline{50} \quad \underline{0} \quad \underline{0}
 \end{array}$$

$$\begin{array}{r}
 \text{L} \quad \text{S} \quad \text{d} \quad \text{L} \quad \text{S} \quad \text{d} \\
 524 \overline{) 232} : 4 : 9 \\
 \underline{20} \quad \underline{4644} \quad \underline{8} \\
 4192 \quad 0 \\
 452 \quad 0 \\
 12 \quad 0 \\
 8433 \quad 10 \\
 5240 \quad 0 \\
 193 \quad 0 \\
 4 \quad 0 \\
 772 \quad \frac{1}{4} \\
 524 \quad 0 \\
 248 \quad 0
 \end{array}$$

0"8"10"

$$\begin{array}{r}
 \text{L} \quad \text{S} \quad \text{d} \quad \text{L} \quad \text{S} \quad \text{d} \\
 345 \overline{) 409} \quad \overline{) 113} \quad \overline{) 9} \quad \text{L} \quad \text{S} \quad \text{d} \\
 345 \quad 1 \quad 0 \\
 64 \quad 139 \\
 20 \quad 0 \\
 1293 \quad 35 \\
 1035 \quad 0 \\
 258 \quad 0 \\
 12 \quad 0 \\
 3105 \quad 9d \\
 3105 \quad 0
 \end{array}$$

$$\begin{array}{r}
 \text{L} \quad \text{S} \quad \text{d} \quad \text{L} \quad \text{S} \quad \text{d} \\
 654 \overline{) 3236} : 12 : 11 \frac{1}{2} \\
 2616 \quad 4 \\
 620 \quad 0 \\
 20 \quad 0 \\
 12412 \quad 18 \\
 654 \quad 0 \\
 5842 \quad 0 \\
 5232 \quad 0 \\
 640 \quad 0 \\
 12 \quad 0 \\
 4684 \quad 11 \\
 654 \quad 0 \\
 1144 \quad 0 \\
 654 \quad 0 \\
 490 \quad 0 \\
 11 \quad 0 \\
 1962 \quad 3\frac{1}{4} \\
 1968 \quad 0
 \end{array}$$

11:18:11:3/4

$$\begin{array}{r}
 103 : 9 \text{ L} \quad \text{S} \quad \text{d} \\
 10 \times 5 \quad 345 \\
 11 \cdot 17 : 6 \times 4 \\
 118 \quad 15 \quad 0 \\
 356 \quad 5 \quad 0 \\
 47 \quad 10 \quad 0 \\
 5 \quad 18 \quad 9 \\
 409 \quad 13 \quad 9 \quad \text{Ans}
 \end{array}$$

Compound Division

$$\begin{array}{r}
 \text{£ s d} \\
 68 \overline{) 132 \text{ " } 2 \text{ " } 18} \\
 \underline{68} \\
 64 \\
 \underline{20} \\
 1280 \text{ (18)} \\
 \underline{68} \\
 600 \\
 \underline{544} \\
 56 \\
 \underline{12} \\
 680 \text{ (10)} \\
 68
 \end{array}$$

1. A merchant bought five pieces of linen, containing as follows: no. 1. 36 yards 3 quarters 2 nails; no. 2. 45 yards 1 quarter 3 nails; no. 3. 48 yards 2 quarters 1 nail; no. 4. 52 yards 3 nails; no. 5. 64 yards 2 quarters; how many yards were in all?

Ans. 247 yds. 2 qrs. 1 nail.

	yards	q	r	n
No 1	36	3	2	
No 2	45	1	3	
No 3	48	2	1	
No 4	52	0	3	
No 5	64	2	0	
	247	2	1	

2. sold 5 head of beef cattle. at the following prices. viz. the first for 6£. 2 s. 10 d. the second for 5£. 10 s. 9 d. the third for 7£. the fourth for 8£. 10 s. 6 d. the fifth for 9£. 2 s. 6 d. and received 22£. 10 s. 6 d. in ready payment. and a note for the remainder; how much did the cattle cost. and for how much was the note given? Ans. the cattle cost 36£. 6 s. 1 1/2 d. and the note was for 13£. 15 s. 4 1/2 d.

$$\begin{array}{r}
 \text{£ s d} \\
 6 \text{ } 2 \text{ } 10 \\
 5 \text{ } 10 \text{ } 9 \frac{1}{2} \\
 7 \text{ } 0 \text{ } 0 \\
 8 \text{ } 10 \text{ } 6 \\
 9 \text{ } 2 \text{ } 6 \\
 \hline
 36 \text{ } 6 \text{ } 1 \frac{1}{2} \\
 \hline
 30 \text{ } 3 \text{ } 9 \frac{1}{2} \\
 \hline
 36 \text{ } 6 \text{ } 1 \frac{1}{2} \\
 \hline
 22 \text{ } 10 \text{ } 6 \\
 \hline
 13 \text{ } 15 \text{ } 4 \frac{1}{2}
 \end{array}$$

Compound Division

25 35

3. A silversmith bought
26 lb. 9 oz. 10 dwt. of silver.
and wrought up 18 lb. 16 dwt.
10 gr. how much has he left?
Ans. 8 lb. 8 oz. 13 dwt. 14 gr.

lb.	oz.	dwt.	gr.
26	9	10	00
18	0	16	10
8	8	13	14

4. A physician bought
6 lb. 10 oz. 6 dr. 2 sc. (apothecaries weight) of medicine.
and has used 4 lb. 5 oz. 1 dr.
1 sc 14 gr. what quantity
has he yet remaining?
Ans. 2 lb. 5 oz. 2 dr 0 sc. 3 gr.

lb.	oz.	dr.	sc.	gr.
6	10	6	2	0
4	5	1	1	14
2	5	2	0	3

5. William was born on
the 15th day of January.
1816. at 6 o'clock in the mor-
ning. and Charles was born
on the 20th of March. 1814.
at 9 in the evening; how much
older is William
than Charles?

Ans 1 year 2 mo. 5 da. 15 h.

y	m	d	h
1814	3	20	21
1816	1	15	6
1	2	5	15

6. What is the value of
642 yards of linen at 2s.
5d. per yard? Ans. 81l. 4s.

2	5	642
10		
14	2	
	10	
121	8	
	6	
7210	0	
89	2	
4	10	
81	4	

Compound Division

7. A goldsmith bought 11 ingots of silver. each of which weighed 11 lb. 103. 15 dwt. 22 gr. how much do they all weigh?

Ans. 11 lb. 103. 15 dwt. 22 gr.

lb	oz	dwt	gr
11	1	15	22
			11
115	7	15	2

8. A innkeeper bought four loads of hay. weighing as follows. viz. first load. 18 hundred 2 quarters and 1 lb. second load. 16 hundred. 3 quarters 18 lb. third load. 22 hundred and 2 lb. fourth load. 24 hundred and 1 quarter: how much hay in all.

Ans. 11 tons 2 hundred.

	Cwt	Q	lb
1	18	2	14
2	16	3	18
3	22	0	24
4	24	1	00
11	2	0	00

9. Bought 8 loads of hay. each load weighing 1 ton 2 hundred 3 quarters 16 lb. how much hay in all.

Ans. 9 ton 3 hun. 16 lb.

	Cwt	Q	lb
1	2	3	16
8			

9. 3. 0. 16

10 Divide 9 ton 3 hundred 16 lb. into eight shares.

Ans. 1 ton 2 hun.

Ans. 1 ton 2 hun. 3. 16 lb.

	Cwt	Q	lb
8	9	3	16

1 " 2 " 3 " 16

11. Bought 15 Tracts of land. each containing 3 hundred acres 2 roods and 20 perches; what is the amount of the whole. Ans. 4509 acres 1 q. 20 r.

2A	U	110
300	R	20
	2	5
1503	0	20
		3
54509	1	20
3901	3	20
300	2	20

27

y. ca
 e
 166
 2.
 11.
 11.

Ans. 300 acres 2 roods 20 perches.

9
ev 16

11.

Ans. 1 doll ~~and~~ 12 cts

Bush

Cano
 red
 hes:
 the
 2070

14. if a man spend 1 pence per day.
how much will it amount
to in year. Ans. 10 l. 12 s. 11 d.

LSJ

les.	0	0	7
			10
	0	5	10
			10
	2	18	4
			3
	8	15	0
	1	15	0
	0	2	11
	10	12	11

15. What is the value of 1000 bushels of coal at $10\frac{1}{2}$ cents per bushel? Ans. 105 dolls.

$$\begin{array}{r} \frac{1}{2} = 1000 \\ \quad \quad \quad 10 \frac{1}{2} \\ \hline 10000 \\ \quad 500 \\ \hline 10500 \end{array}$$

Ins.
mc

Compound Division

16. Bought 135 gallons of linen
dy at 1 dollar and 62 1/2 cents per
gallon: required the prime cost.
what it was sold for: and the
gain: Ans. prime cost 219
dolls. 37 1/2 cts: sold for 276
dolls. 45 cts gain 57 dolls. 37 1/2 cts.

$$\begin{array}{r} 1 \cdot 35 \\ 1 \cdot 62 \frac{1}{2} \\ \hline 2 \cdot 90 \\ 81 \cdot 0 \\ \hline 135 \end{array}$$

$$\begin{array}{r} 6 \cdot 7 \frac{1}{2} \\ \hline 219 \cdot 37 \frac{1}{2} \end{array}$$

$$\begin{array}{r} 2 \cdot 05 \\ 1 \cdot 35 \\ \hline 10 \cdot 25 \\ 61 \cdot 5 \\ \hline 205 \\ 276 \cdot 45 \\ 219 \cdot 37 \frac{1}{2} \\ \hline 57 \cdot 37 \frac{1}{2} \end{array}$$

17. if 27 Cwt. of sugar cost 47l.
12s. 10 1/2 d. what cost 1 Cwt:

Ans. 1l. 15s. 3 1/2 d.

$$\begin{array}{r} 9 \cdot 44 = 12 = 10 \frac{1}{2} \\ 3 \cdot 5 \quad 5 \cdot 10 \frac{1}{2} \\ \hline 1 \quad 15 \quad 3 \frac{1}{2} \end{array}$$

$$\begin{array}{r} 27 \cdot 44 = 12 = 10 \frac{1}{2} \quad 1 = 15 \cdot 3 \frac{1}{2} \\ \hline 27 \\ 20 \\ \hline 412 \\ 271 \\ \hline 142 \\ 135 \\ \hline 7 \\ 94 \\ 81 \\ \hline 13 \\ 4 \\ \hline 54 \end{array}$$

18. Suppose a man has an estate of 9408 dollars. which he divides among his four sons: to his eldest he gives 2/5 and to the other three an equal share each of the remain. der: what is the share of each:

Ans. eldest son. 3883 dolls 20 cents. other sons. each 1941 dolls. 60 cents.

$$\begin{array}{r} 9408 \\ 2 \\ \hline 519416 \\ 3883 \cdot 20 \end{array}$$

$$\begin{array}{r} 59408 \\ 1941 = 60 \end{array}$$

Reduction Reduction

1. Reduce 100 cents to pence:

$$\begin{array}{r} 10 \overline{) 100 \text{ cents}} \\ 90 \\ \hline 10 \text{ pence. Ans.} \end{array}$$

5. Reduce 260 cents to pence.

Ans. 234.

2. Reduce 90 pence to cents

$$\begin{array}{r} 9 \overline{) 90 \text{ pence}} \\ 10 \\ \hline 100 \text{ cents. Ans.} \end{array}$$

$$\begin{array}{r} 260 \\ 26 \\ \hline 234 \end{array}$$

6. Reduce 480l. 19s. 9d. to cents.

3. Reduce 125l. 10s. 6½d. to farthings.

$$\begin{array}{r} 125 \text{ l. } 10 \text{ s. } 6 \frac{1}{2} \text{ d.} \\ 20 \overline{) 2510} \\ 30126 \text{ pence} \\ 4 \overline{) 30126} \\ 120506 \text{ farthings. Ans.} \end{array}$$

$$\begin{array}{r} \text{£} \quad \text{s} \quad \text{d} \\ 480 \quad 19 \quad 9 \\ 20 \overline{) 9619} \\ 12 \\ \hline 9115134 \\ 12826 \quad \frac{3}{9} = \frac{1}{3} \\ \hline 128363 \quad \frac{1}{3} \end{array}$$

7. Reduce 4658 pence to pounds.

Ans. 19l. 8s. 2d.

4. Reduce 120506 farthings to pounds.

Ans. 125l. 10s. 6½d.

$$\begin{array}{r} 12 \overline{) 4658} \\ 20 \overline{) 388} \quad 8 = 2 \\ \hline 19 = 8 = 2 \end{array}$$

11) 120506 farthings

8. Reduce 648 pence to cents.

Ans. 720 cents.

$$\begin{array}{r} 9 \overline{) 648} \\ 72 \\ \hline 720 \end{array}$$

$$\begin{array}{r} 12 \overline{) 30126 \frac{1}{2}} \\ 20 \overline{) 2510 \dots 6} \\ 125 \quad 10 \quad 6 \frac{1}{2} \\ 20 \\ \hline 2510 \\ 12 \\ \hline 30126 \\ 4 \\ \hline 120506 \end{array}$$

Reduction Reduction

7. Reduce 420 cents to pence.

Ans. 648 pence.

$$\begin{array}{r} 10 \overline{) 420} \\ \underline{42} \\ 648 \end{array}$$

10. Reduce 24235 half-pence to pounds.
Ans. 50l. 9s. 9½d.

$$\begin{array}{r} 2 \overline{) 24235} \\ 12 \overline{) 12117} = 1014 \\ 20 \overline{) 1009} = 50 \\ 50 = 9 = 9\frac{1}{2} \end{array}$$

11. How many pounds. pennsyl
vania currency. in 216
french crowns:
Ans. 89l. 2s.

$$\begin{array}{r} 216 \\ 99 \\ \hline 1944 \\ 1944 \\ \hline 12 \overline{) 21384} \\ 20 \overline{) 1782} \\ \hline 89 = 2 \end{array}$$

12. in 29l. 17s. how many
cents and dollars:

Ans. 4960 cents — 49 dolls. 60cts.

$$\begin{array}{r} 29 \text{ l. } 17 \text{ s.} \\ 20 \\ \hline 597 \\ 12 \\ \hline 9 \overline{) 4164} \\ \underline{496} \\ 100 \overline{) 4960} \\ \underline{49} = 60 \end{array}$$

49 60

13. in 375l. pennsylvania
currency. how many dollars:

Ans. 1000 dolls.

$$\begin{array}{r} \$ \\ 375 \\ 20 \\ \hline 4500 \\ 12 \\ \hline 990000 \\ 100000 \\ \hline 1000000 \end{array}$$

To Troy Weight

1. Reduce 115200 grains to pounds.

Ans. 20lb.

$$\begin{array}{r} 20 \overline{) 115200} \\ 20 \overline{) 4800} \\ 12 \overline{) 240} \\ \hline 20 \end{array}$$

2. Reduce 30lb. to grains.

~~Ans. 27200gr.~~ Ans. 142800gr.

$$\begin{array}{r} \$ \\ 30 \\ 24 \\ \hline 420 \\ 20 \\ \hline 14400 \\ 12 \\ \hline 142800 \end{array}$$

Reduction Reduction

31

3. Reduce 45648 penny weights to ounces. Ans. 228203.8 dwt.

$$\begin{array}{r} 20 \overline{) 45648} \\ 22824 = 8 \end{array}$$

11. Reduce 11 lb. 8 oz. 15 dwt 20 gr. to grains. Ans. 27260 gr.

lb	oz	dwt	gr
11	8	15	20
12			

$$\begin{array}{r} 56 \\ 20 \end{array}$$

$$\begin{array}{r} 1135 \\ 21 \end{array}$$

$$\begin{array}{r} 27260 \end{array}$$

5. Reduce 27260 grains to pounds. Ans. 11 lb. 8 oz. 15 dwt. 20 gr.

$$\begin{array}{r} 21 \overline{) 27260} \\ 20 \overline{) 1135} = 11 \\ 12 \overline{) 56} = 15 \end{array}$$

$$11 = 8 = 15 = 11$$

6. In 24 spoons. each weighing 8 dwt. 6 gr. how many grains. Ans. 4752 gr.

dwt	gr
8	6

$$24$$

$$198$$

$$24$$

$$792$$

$$376$$

$$4752$$

Avoirdupois Weight

1. Reduce 3 tons to pounds. Ans. 6720 lb.

$$\begin{array}{r} 3 \\ 20 \\ \hline 60 \\ 11 \\ \hline 240 \\ 28 \\ \hline 1920 \\ 480 \\ \hline 6720 \end{array}$$

2. Reduce 2867200 drams to tons. Ans. 5 tons.

$$\begin{array}{r} 16 \overline{) 2867200} \\ 16 \overline{) 179200} \\ 28 \overline{) 11200} \end{array}$$

$$\begin{array}{r} 4 \overline{) 400} \\ 20 \overline{) 100} \\ 5 \end{array}$$

3. Reduce 5 tons to drams. Ans. 2867200 dr.

$$\begin{array}{r} 5 \\ 16 \\ \hline 80 \\ 16 \\ \hline 1280 \\ 28 \\ \hline 35840 \\ 4 \\ \hline 143360 \\ 20 \\ \hline 2867200 \end{array}$$

32 Reduction Reduction

4. In 6 barrels of flour. each weighing 1 cwt. 3 gr. how many pounds.

Ans. 1176 lb.

$$\begin{array}{r} 1 = 3 \\ 4 \\ \hline 7 \\ 28 \\ \hline 196 \\ 6 \\ \hline 1176 \end{array}$$

5. In 16 cwt. 2 gr. 1 lb. how many pounds: Ans. 1862 lb.

cwt	gr	lb
16	2	14
4		
66		
28		
532		
133		
1862		

6. In a load of hay weighing 2846 lb. how many hundred.

Ans. 25 cwt. 2 gr. 20 lb.

$$\begin{array}{r} 28 \overline{) 2846} \\ 4 \overline{) 102} = 20 \\ 20 \overline{) 55} = 2 \\ 15 = 2 = 20 \end{array}$$

1. Reduce 15 lb. to scruples.

Ans. 4320 sc.

$$\begin{array}{r} 15 \\ 3 \\ \hline 45 \\ 8 \\ \hline 360 \\ 12 \\ \hline 4320 \end{array}$$

2. In a bottle containing 3 lb. of calomel. how many grains:

Ans. 17280 gr.

$$\begin{array}{r} 3 \\ 20 \\ \hline 60 \\ 3 \\ \hline 180 \\ 1440 \\ 12 \\ \hline 17280 \end{array}$$

3. In 24 lb. of drugs. how many parcels. each 16 drams:

Ans. 15 parcels.

$$\begin{array}{r} 24 \\ 16 \\ \hline 30 \\ 8 \\ \hline 16 \overline{) 240} 15 \\ 16 \\ \hline 80 \\ 80 \end{array}$$

4. In 546000 grains. how many pounds:

Ans. 100 lb.

Reduction Reduction

33

$$\begin{array}{r} 20 \overline{) 546000} \\ 3 \overline{) 28800} \\ 8 \overline{) 9600} \\ 12 \overline{) 1200} \\ 100 \end{array}$$

Cloth Measure Cloth Measure

1. Reduce 250 yards to nails.
Ans. 4000 nails.

$$\begin{array}{r} 250 \\ 4 \\ \hline 1000 \\ 4 \\ \hline 4000 \end{array}$$

2. In 8642 nails how many
ells English:
Ans. 432 ells E. 2 nails.

$$\begin{array}{r} 8642 \\ 4 \overline{) 1728} = 2 \\ 432 = 2 \end{array}$$

3. In 324 ells french how
many yards:
Ans. 486 yds.

$$\begin{array}{r} 324 \\ 6 \\ \hline 1944 \\ 486 \end{array}$$

4. In 16 bales of cloth. each measuring
36 ells flemish. how many yards:
Ans. 432 yds.

$$\begin{array}{r} 36 \\ 16 \\ \hline 216 \\ 36 \\ \hline 576 \\ 3 \\ \hline 1728 \\ 432 \end{array}$$

Long Measure Long Measure
Long Measure

1. Reduce 260 miles to inches.
Ans. 16473600 inches.

$$\begin{array}{r} 260 \\ 8 \\ \hline 2080 \\ 40 \\ \hline 83200 \\ 5\frac{1}{2} \\ \hline 416000 \\ 41600 \\ \hline 457600 \\ 3 \\ \hline 1372800 \\ 12 \\ \hline 16473600 \end{array}$$

2. Reduce 11 miles 4 furlongs 38
perches 2 yards 2 feet. to bar
leycorns. Ans. 2280060 li.

$$\begin{array}{r} M \text{ fur } p \text{ yds } ft \\ 11 \quad 4 \quad 38 \quad 2 \quad 2 \\ 8 \\ \hline 95 \\ 40 \\ \hline 3838 \\ 5\frac{1}{2} \end{array}$$

$$\begin{array}{r} 19192 \\ 1919 \\ \hline 21111 \\ 3 \\ \hline 63335 \\ 12 \\ \hline 760020 \\ 3 \\ \hline 2280060 \end{array}$$

Reduction Reduction

3. Reduce 1264200 feet to geographical degrees.
Ans. 4 degrees.

$$\begin{array}{r} 3 \overline{) 1264200} \\ 220 \overline{) 422400} \quad (1920 \\ 220 \\ \hline 2024 \\ 1980 \\ \hline 440 \\ 440 \end{array}$$

$$\begin{array}{r} 8 \overline{) 1920} \\ 60 \overline{) 240} \quad (4 \\ 240 \end{array}$$

4. Reduce 3 leagues 2 furlongs 110 yards 1 foot 5 inches. to inches.
Ans. 590054 inches.

	3	2	110	1	5
	3				
	3				
	9				
	8				
	44				
	220				
	1540				
	148				
	1639	8			
	491	41			
		12			
	5900	54			

5. How many inches will reach round the world. at 60 miles to a degree: Ans. 1368546000 inches.

$$\begin{array}{r} 360 \text{ Deg} \\ 60 \text{ Miles} \\ \hline 21600 \\ 8 \\ \hline 172800 \text{ fur} \\ 220 \text{ fur} \\ \hline 3456000 \\ 345600 \\ \hline 38016000 \text{ ft} \\ 3 \\ \hline 114048000 \text{ in} \\ 1368546000 \end{array}$$

Land Measure.

1. Reduce 25 acre to perches.
Ans. 4000 perches.

$$\begin{array}{r} 25 \\ 4 \\ \hline 100 \\ 40 \\ \hline 4000 \end{array}$$

2. Reduce 146000 perches to acres.
Ans. 1100 acres.

$$\begin{array}{r} 20 \overline{) 146000} \\ 4400 \\ \hline 1100 \end{array}$$

3. A tract of land containing 640000 perches is to be divided into 400 equal shares. how many acres will be in each share: Ans. 10 acres.

$$\begin{array}{r} 400 \overline{) 640000} \\ 1600 \\ \hline 160 \end{array}$$

Reduction James N^o 35

1 In 10 acres how many square inches: Ans. 62726400 inches.

$$\begin{array}{r}
 10 \\
 4 \\
 \hline
 40 \\
 40 \\
 \hline
 1600 \\
 30 \frac{1}{4} \\
 \hline
 48000 \\
 400 \\
 \hline
 48400 \\
 9 \\
 \hline
 135600 \\
 144 \\
 \hline
 1442400 \\
 1442400 \\
 \hline
 435600 \\
 62726400
 \end{array}$$

Cubic or solid Measure

1 Reduce 3200 feet of wood to cords. Ans. 25 cords.

$$\begin{array}{r}
 128 \overline{) 3200} (25 \\
 \underline{256} \\
 640 \\
 \underline{640} \\
 0
 \end{array}$$

2 In 20 tons of square timber how many feet: Ans. 1000 feet.

$$\begin{array}{r}
 20 \\
 50 \\
 \hline
 1000
 \end{array}$$

3 In 30 tons of square round timber how many inches: Ans. 2043600 inches.

$$\begin{array}{r}
 30 \\
 40 \\
 \hline
 1200 \\
 1428 \\
 \hline
 9600 \\
 2400 \\
 \hline
 1200 \\
 2043600
 \end{array}$$

1 In a grindstone 48 inches diameter and 6 inches thick how many feet:

$$\begin{array}{r}
 48 \text{ diameter} \\
 24 \text{ half do.} \\
 \hline
 42 \\
 24 \\
 \hline
 288 \\
 144 \\
 \hline
 1428 \\
 1728 \overline{) 10368} (6 \text{ cubic feet. Ans} \\
 \underline{10368} \\
 0
 \end{array}$$

5 In a mill-stone 4 feet 6 inches diameter and averaging 18 inches in thickness. how many cubic feet

$$\begin{array}{r}
 54 \\
 24 \\
 \hline
 81 \\
 24 \\
 \hline
 564 \\
 162 \\
 \hline
 2184 \\
 18 \\
 \hline
 14496 \\
 2184 \\
 \hline
 16680
 \end{array}$$

$$\begin{array}{r}
 1428 \overline{) 39366} (22 \text{ feet } 1350 \text{ inc} \\
 \underline{3256} \\
 6806 \\
 3456 \\
 \hline
 1350
 \end{array}$$

36 Reduction Reduction

Times

Time

Liquid Measure.

1. Reduce 8 Wks 2 days 6 hours 20 minutes. to minutes.

Ans. 83900 min. $\frac{8}{4}$ 2 6 20

$$\begin{array}{r} 8 \\ 58 \\ 24 \\ \hline 238 \\ 116 \\ \hline 1398 \\ 60 \\ \hline 83900 \end{array}$$

2. Reduce 10 years to seconds.

Ans. 315 576 000 sec.

$$\begin{array}{r} 365 = 6 \\ 24 \\ \hline 1466 \\ 430 \\ \hline 8966 \\ 10 \\ \hline 89660 \\ 60 \\ \hline 525900 \\ 60 \\ \hline 315576000 \end{array}$$

How many seconds in one week.

Ans. 604800 sec.

$$\begin{array}{r} 7 \\ 24 \\ \hline 28 \\ 14 \\ \hline 168 \\ 60 \\ \hline 10080 \\ 60 \\ \hline 604800 \end{array}$$

1. Reduce 4 tuns to pints. Ans 8064 pints.

$$\begin{array}{r} 4 \\ 4 \\ \hline 16 \\ 63 \\ \hline 48 \\ 96 \\ \hline 1008 \\ 4 \\ \hline 4032 \\ 2 \\ \hline 8064 \end{array}$$

2. Reduce 4032 pints to hogsheads. Ans. 8 hhd.

$$\begin{array}{r} 4032 \\ 24032 \\ \hline 24016 \\ 63 \overline{) 504} 8 \\ 504 \end{array}$$

3. Reduce 38 hogsheads to pints. Ans 19152 pints.

$$\begin{array}{r} 38 \\ 63 \\ \hline 114 \\ 228 \\ \hline 2394 \\ 4 \\ \hline 9576 \\ 2 \\ \hline 19152 \end{array}$$

1. Reduce 48 bushels 2 pecks 4 quarts to pints. Ans. 5054 pints.

Dry Measure Dry Measure

1. Reduce 48 bushels 2 pecks 4 quarts to pints. Ans 5054 pints.

$$\begin{array}{r} 48 = 3 = 1 \\ 4 \\ \hline 315 \\ 8 \\ \hline 2524 \\ 2 \\ \hline 5054 \end{array}$$

2. Reduce 2196 pints to bushels. Ans. 34 bu. 1 pc. 2 qt.

$$\begin{array}{r} 2196 \\ 31098 \\ \hline 4134 = 2 \\ 34 = 1 = 2 \end{array}$$

of Decimal Arithmetick

Addition of Decimals James

Examples

Examples Examples

$$\begin{array}{r} 1. \quad 2468.5036 \\ \quad 521.0428 \\ \quad 32.0004 \\ \hline 3021.5468 \end{array}$$

$$\begin{array}{r} 2. \quad 3460000.0000643 \\ \quad 460000.000643 \\ \quad 3400.3680005 \\ \hline 3923400.3684078 \\ \quad 463400.3686435 \\ \hline 3923400.3684078 \end{array}$$

3. Add $283.604 + 490006.003245 + 21.05 + 1.2 + 6200.3476$
 Ans. 496512.204845 .

$$\begin{array}{r} 283.604 \\ 490006.003245 \\ 21.05 \\ 1.2 \\ 6200.3476 \\ \hline 496512.204845 \end{array}$$

4. Add one hundred and twenty-five and five-tenths.
 + ten thousands and five millionths. + fifteen and seven-hy-
 - two thousandths. + two and one-hundredth.

Ans. 10142.582005 .

$$\begin{array}{r} 125.5 \\ 10000.0000005 \\ 15.042 \\ 2.01 \\ \hline 10142.582005 \end{array}$$

Section 2.

Subtraction of Decimals

1. From 6432.50434
Take 369.95129
Rem 6062.55008

2. 848.045000
162.459368
685.585632
848.045000

3. 15.6544
7.3500
8.3044
15.6544

4. From 45.005 take 23.65482
Ans. 21.35018.

45.00500
23.65482
21.35018

5. From six hundred and twenty
and two-tenths. take two
hundred and two thousandths.
Ans. 420.198.

620.200
200.002
420.198

Section 3.

Multiplication of Decimals

Multiply 29.831
by .952
59662
149155
268479
28.399112

2. 24.021
4.23
42063
48042
96084
101.60883

3. 22.2043
1.2345
1110215
888172
666129
444086
222043
2441120835

4. Multiply .385746
00463

1154238
2314476
1542984
0000000
0000000
000148600398

5. 158.694
23.15
493470
158694
446082
314388
3673.76610

6. 024653
100022
049306
049306
00000542366

Division of Decimals: s s s s s s s s

Examples

29.831) 28.399112(952
 26 8449
 1 55121
 1 49155
 59662
 59662

1.

$$\begin{array}{r} 24.021 \overline{) 101.60883} \quad (4.23 \\ \underline{96.084} \\ 55248 \\ \underline{48042} \\ 72063 \\ \underline{72063} \\ 0 \end{array}$$

2.

$23.4 \overline{) 6532.1}$

$ \begin{array}{r} 444 \\ \hline 1492 \\ 1659 \\ \hline 1331 \\ 1185 \\ \hline 1460 \\ 1422 \\ \hline 380 \\ 234 \\ \hline 1430 \\ 1422 \\ \hline 8 \end{array} $	$ \begin{array}{r} 2756.16 + 3 \\ \hline 20 \\ 3.20 \\ \hline 12 \\ 2.40 \\ \hline 4 \\ 10.60 \\ \hline \end{array} $
--	---

$$\begin{array}{r} 64.25 \overline{) 234.40525} \quad (3.653 \\ 192 \quad 75 \\ \hline 41 \quad 955 \\ 38 \quad 550 \\ \hline 3 \quad 4052 \\ 3 \quad 2125 \\ \hline 192 \quad 75 \\ 192 \quad 75 \end{array}$$

$$\begin{array}{r} 3) 10 (3.3333 + \\ \underline{9} \\ 10 \\ \underline{9} \\ 10 \\ \underline{9} \\ 10 \\ \underline{9} \\ 10 \\ \underline{9} \\ 1 \end{array}$$

5

9) 9(10

6

00463) 00178600398 (385446
 1389
 3970
 3404
 2660
 2315
 3453
 3241
 2129
 1852
 2448
 2448

Reduction of Decimals

Section 5.

1. Reduce $\frac{1}{4}$ to a decimal.

$$\begin{array}{r} 25 \overline{)100} \text{ num} \\ 25 \text{ Deno} \end{array}$$

2. Reduce $\frac{1}{2}$ to a decimal.

$$\begin{array}{r} 2 \overline{)10} \\ 5 \end{array}$$

3. Reduce $\frac{3}{4}$ to a decimal.

$$\begin{array}{r} 4 \overline{)300} \\ 75 \end{array}$$

4. Reduce $\frac{7}{8}$ to a decimal.

$$\begin{array}{r} 8 \overline{)7000} \\ 875 \end{array}$$

5. Reduce $\frac{1}{5}$ to a decimal.

$$\begin{array}{r} 25 \overline{)100} \\ 04 \end{array}$$

6. Reduce $\frac{57}{60}$ to a decimal.

$$\begin{array}{r} 60 \overline{)570} \\ 95 \end{array}$$

7. Reduce $\frac{6}{15}$ of a dollar to cents.

$$\begin{array}{r} 15 \overline{)600} \\ 40 \end{array}$$

3 Examples 3 Example 3

1. Reduce 17s. 8 $\frac{3}{4}$ d. to the decimal of a pound

$$\begin{array}{r} 41 \overline{)3} \\ 12 \overline{)8.75} \\ 20 \overline{)17.7291666} + \text{Ans} \\ .8864583 \end{array}$$

2. Reduce 19s. to the decimal of a pound

$$\begin{array}{r} 20 \overline{)19} \\ 95 \end{array}$$

3. Reduce 3d. to the decimal of a shilling.

$$\begin{array}{r} 12 \overline{)3} \\ 25 \end{array}$$

4. Reduce 3d. to the decimal of a pound.

$$\begin{array}{r} 12 \overline{)3} \\ 20 \overline{)25} \\ .0125 \end{array}$$

5. Reduce 11wt. 2gr. to the decimal of a ton.

$$\begin{array}{r} 41 \overline{)2} \\ 20 \overline{)4.5} \\ 225 \end{array}$$

6. Reduce 2gr. 11lb. to the decimal of a cwt.

$$\begin{array}{r} 28 \overline{)11} \\ 41 \overline{)2.5} \\ .625 \end{array}$$

7. Reduce 3gr. 3na. to the decimal of a yard.

$$\begin{array}{r} 41 \overline{)3} \\ 41 \overline{)3.75} \\ .9375 \end{array}$$

1. Reduce .8864583 of a pound to its equivalent value in integers.

$$\begin{array}{r} 8864583 \\ 20 \\ 17.7291660 \\ 12 \\ 8.7499920 \\ 41 \\ 2.9999680 \end{array}$$

2. What is the value of 45 of a pound: Ans. 15s.

$$\begin{array}{r} 45 \\ 20 \\ 15.00 \end{array}$$

3. What is the value of 10 of a pound troy: Ans. 80 $\frac{3}{4}$ s. 8dwt.

$$\begin{array}{r} 7 \\ 12 \\ 8.4 \\ 20 \\ 8.0 \end{array}$$

Reduction of Decimals

11. what is the value of .614 of a cwt.: Ans. 2 qrs. 13 lb. 10 s. 10 d.

$$\begin{array}{r}
 614 \\
 \underline{11} \\
 2.468 \\
 28 \\
 \hline
 8444 \\
 936 \\
 \hline
 13.104 \\
 16 \\
 \hline
 624 \\
 104 \\
 \hline
 1.664 \\
 16 \\
 \hline
 3984 \\
 664 \\
 \hline
 10.624
 \end{array}$$

5. what is the value of .3375 of an acre: Ans. 1 rood 14 per.

$$\begin{array}{r}
 3375 \\
 \underline{11} \\
 1.3500 \\
 40 \\
 \hline
 14.0000
 \end{array}$$

6. what is the value of .258 of a tun of wine: Ans. 1 hhd. 2 + gal

$$\begin{array}{r}
 258 \\
 \underline{11} \\
 1.032 \\
 63 \\
 \hline
 096 \\
 192 \\
 \hline
 2.016
 \end{array}$$

7. what is the proper quantity of .761 of a day: Ans. 18 h. 15 mi. 50.4 sec.

$$\begin{array}{r}
 761 \\
 \underline{24} \\
 3044 \\
 1522 \\
 \hline
 18.264 \\
 60 \\
 \hline
 15.840 \\
 60 \\
 \hline
 50.400
 \end{array}$$

8. what is the ~~sum~~ proper quantity of .3 of a year:

Ans. 109 d. 12 h.

8. what is the proper quantity of .7 of a lb. of silver:

Ans. 8 oz. 8 dwt.

$$\begin{array}{r}
 7 \\
 \underline{12} \\
 8.4 \\
 20 \\
 \hline
 8.0
 \end{array}$$

9. what is the proper quantity of .3 of a year: Ans. 109.12 h.

$$\begin{array}{r}
 365 \\
 \underline{3} = 6 \\
 109.5 \\
 24 \\
 \hline
 12.6
 \end{array}$$

10. what is the difference between .41 of a day and .16 of an hour: Ans. 9 h. 40 mi. 48 sec.

$$\begin{array}{r}
 41 \\
 \underline{24} \\
 164 \\
 82 \\
 \hline
 9.84 \\
 60 \\
 \hline
 50.40 \\
 60 \\
 \hline
 44.00 \\
 16 \\
 \hline
 60 \\
 \hline
 9.60 \\
 60 \\
 \hline
 56.00
 \end{array}$$

h	m	s
9	50	24
0	9	36
9	40	48

11. what is the sum of .18 lb. .19 cwt. .14 qrs. and .7 lb. Ans. 3 cwt. 2 qrs. 15.54 lb.

18	19	14	7
20			
3.59			
4			
2.53			
28			
431			
106			
14.91			

14	91	91
20		
3.2		
12.2		
25.48		

The Single Rule

1. If 8 yards of cloth cost 32 dollars, what will 24 yards cost?

$$\begin{array}{r} \text{yds. } D \\ \text{Ans. } : 32 :: 24 \text{ } D \\ \hline 128 \\ 64 \\ \hline 96 \end{array}$$

96 Ans

2. When sugar is sold at 12 dollars 32 cents per cwt. what will 16 lb. cost?

Ans. 1 doll. 16 cts.

$$\begin{array}{r} \text{lb. } D \\ 112 :: 12.32 : 16 \\ \hline 112 \overline{) 19712} \quad 176 \quad 32 \\ \underline{112} \quad \quad 48 \\ 851 \quad 32 \\ \underline{784} \quad 16 \\ 672 \quad 176 \quad 9712 \quad 112 \\ \underline{672} \quad \quad 76 \\ 211 \\ \underline{176} \\ 352 \\ \underline{352} \end{array}$$

3. What is the amount of 3 cwt. of coffee at 36 cents per pound?

Ans. 120 dollars 96 cts.

$$\begin{array}{r} \text{lb. } C \quad \text{cwt} \\ 1 :: 36 : 3 \\ \hline 216 \\ 108 \\ \hline 108 \\ \hline 120.96 \end{array}$$

4. What will 4 pieces of linen come to containing 23.24.25. and 27 yards at 12 cents per yard?

$$\begin{array}{r} 23 \\ 24 \\ 25 \\ 27 \\ \hline 99 \end{array}$$

1 :: 12 : 99

$$\begin{array}{r} 648 \\ \underline{648} \\ 71.28 \end{array}$$

5. What will 11 cwt. 2 qr 8 lb. of iron come to at 18 cents for 1 lb.

Ans. 61 dollars 11 cts.

$$\begin{array}{r} \text{lb. } \text{cwt} \quad \text{qr} \quad \text{lb.} \\ 11 :: 18 : 11 \quad 2 \quad 8 \\ \hline 18 \\ 28 \\ \hline 152 \\ 36 \\ \hline 512 \\ 48 \\ \hline 4096 \\ 2048 \\ \hline 11 \overline{) 24576} \\ 61.11 \end{array}$$

6. What will 128 lb. of pork come to at 8 cts. per pound?

Ans. 10 dollars 24 cts.

$$\begin{array}{r} \text{lb. } \text{cts} \quad \text{lb.} \\ 128 :: 8 : 128 \\ \hline 128 \\ 64 \\ 16 \\ 8 \\ \hline 128 \overline{) 1024} \\ 1024 \end{array}$$

of Three Direct by J. McCormick

7. If $9\frac{1}{2}$ dozen pair of stockings cost 8 dollars

Stockings

10 cts. what will 3 pair cost: Ans. 1 doll 80 cts.

$$\begin{array}{r} 9.5 \\ 12 \\ \hline 114 \\ 114 \overline{) 205.20} \quad 1.80 \\ \underline{114} \\ 912 \\ \underline{912} \end{array}$$

10. If 14 cwt. 3 qrs. 14 lb. of sugar cost 320 dollars 80 cts. what must be paid for 60 cwt. 3 qrs. 14 lb. Ans. 6 cents.

$$\begin{array}{r} \text{cwt} \quad \text{qr} \quad \text{lb} \quad \text{¢} \\ 14 \quad 3 \quad 14 \quad 320.80 \\ \hline 14 \quad 3 \quad 14 \quad 320.80 \\ \hline 192.480 \end{array}$$

8. If 20 bushels of oats cost 9 dollars 60 cents. what will 3 bushels come to: Ans. 1 doll. 48 cts.

$$\begin{array}{r} \text{bu} \quad \text{¢} \\ 20 \quad 960 \\ \hline 20 \quad 960 \end{array}$$

$$\begin{array}{r} 20 \overline{) 2880} \quad 1.44 \\ \underline{20} \\ 88 \\ \underline{80} \\ 80 \\ \underline{80} \end{array}$$

$$\begin{array}{r} 143 \overline{) 2005} \\ \underline{16} \\ 12030 \\ \underline{2005} \\ 32080 \end{array}$$

8. A merchant bought a piece of cloth for 16 dollars 50 cents at 45 cents per yard; how many yards were there in the piece:

Ans. 22 yds.

$$\begin{array}{r} \text{¢} \quad \text{yds} \\ 1650 \quad 45 \\ \hline 1650 \end{array}$$

$$\begin{array}{r} 1650 \overline{) 36300} \quad 22 \\ \underline{3300} \\ 3300 \\ \underline{3300} \end{array}$$

11. If 9 lb. of silver is worth 94 dollars what is the value of 1503 lb. Ans. 1 doll. 25 cts.

$$\begin{array}{r} \text{lb} \quad \text{¢} \\ 9 \quad 94 \\ \hline 1503 \end{array}$$

$$\begin{array}{r} 116.4 \overline{) 1455} \quad 1.25 \\ \underline{1164} \\ 2910 \\ \underline{2328} \\ 5820 \end{array}$$

12. If 125.5 acres sold for 624.5 dollars. what will 4.75 acres cost: Ans. 23 dolls. 75 cts.

$$\begin{array}{r} \text{Acres} \quad \text{¢} \\ 125.5 \quad 624.5 \\ \hline 4.75 \end{array}$$

$$\begin{array}{r} 31345 \\ 43925 \\ 25100 \\ \hline 125500 \overline{) 2980625} \quad 23.75 \\ \underline{251000} \\ 470625 \\ \underline{376500} \\ 941250 \\ \underline{878500} \\ 627500 \\ \underline{627500} \end{array}$$

Continued Continued

13. If 1.5 gallons of wine cost 40 dollars. 50 cents. what will 1.5 tuns cost:

Ans. 1134 dollars.

gal	℥	℥
1.5 ::	4,50 :	1.5
	378,0	1
	36000	60
	3150	63
	1350	180
	1401000	360
		3780

1.5	1401000	1134,00
1.5		
20		
15		
51		
45		
60		
60		
00		

15. when iron is sold for 224 dol
lars per ton, what will 197. 14 lb.
cost: Ans. 11 dolls. 20 cts.

℥	℥	qr	lb
1:	224 ::	1:	14
20		28	
20		12	
4		42	
80		224	
28		168	
640		84	
160		84	
2240		84	

2240	9408	11,20
	8960	
	4480	
	4480	

16. A merchant paid 1402 dolla
50 cents for flour, at 5 dollars 50
cents per barrel; how many
barrels must he receive:

Ans. 255 barrels.

℥	℥	℥
5,50 :	1 ::	1402,50

5,50	1402,50	255
	1400	
	3025	
	2750	
	2750	
	2750	

14. How many reams of paper at,
dollar 66 cents. 1 dollar 94 cents. and
2 dollars 31 cents per ream may be
purchased for 528 dollars 66 cents. of
each an equal number.

Ans. 89 reams of each sort.

166	℥	℥
194		
231		
894 ::	1 ::	528,66

594	52866	89
	4452	
	5346	
	5346	

17. A man has a yearly salary of
1186 dollars 25 cents. how much is
it per day: Ans. 3 dolls 25 cts.

Days	℥	year
365 :	1186,25 ::	1

365	1186,25	3,25
	1095	
	912	
	730	
	1825	
	1825	

Continued in September by J. H. H.

18. A man spends 2 dollars 25 cents per day, and saves 378 dollars 75 cents at the end of the year, what is his yearly salary?

Ans. 1200 dolls.

$$\begin{array}{r}
 \text{Days} : 2,25 :: 365 \\
 1 : 2,25 :: 225 \\
 \hline
 1825 \\
 430 \\
 \hline
 430 \\
 82125 \\
 37875 \\
 \hline
 1200,00
 \end{array}$$

19. What will 11. 10cwt. 19r 12 lb. of hay come to at 1 dollar 12 cents per cwt. Ans. 101 dolls. 20 cts.

$$\begin{array}{r}
 \text{cwt} : 1,12 :: 11 \\
 1 : 1,12 :: 20 \\
 \hline
 20 \\
 90 \\
 \hline
 112 \\
 28 \\
 \hline
 32 \\
 8 \\
 \hline
 112 \\
 2900 \\
 422 \\
 \hline
 10120 \\
 112 \\
 \hline
 20240 \\
 10120 \\
 \hline
 10120 \\
 112 \\
 \hline
 112 \\
 1133440 \\
 1,12 \\
 \hline
 134 \\
 112 \\
 \hline
 224 \\
 224 \\
 \hline
 0
 \end{array}$$

20. How much will a grindstone 4 feet 6 inches diameter, and 9 inches thick, come to at 1 dollar 10 cents per cubic foot. Ans. 12 dolls. 53 cts.

$$\begin{array}{r}
 \text{ft} \quad \text{in} \quad \text{in} \\
 4 : 6 : 9 \\
 12 \\
 \hline
 54 \\
 27 \\
 \hline
 81 \\
 27 \\
 \hline
 567 \\
 162 \\
 \hline
 2187 \\
 9 \\
 \hline
 19683 \\
 110 \\
 \hline
 196890 \\
 19683 \\
 \hline
 1728 \\
 2165130 \\
 \hline
 1728 \\
 4371 \\
 3456 \\
 \hline
 9153 \\
 8640 \\
 \hline
 5130 \\
 5184
 \end{array}$$

21. What will a grindstone 28 inches diameter, and 3.5 inches thick, come to at 1 dollar 90 cents per cubic foot. Ans. 2 dolls. 26 cts.

$$\begin{array}{r}
 \text{in} \quad \text{in} \\
 28 : 3,5 \\
 124 \\
 42 \\
 \hline
 138 \\
 42 \\
 \hline
 588 \\
 35 \\
 \hline
 2940 \\
 1764 \\
 \hline
 1728 : 190 : 20580 \\
 190 \\
 \hline
 1852200 \\
 20580 \\
 \hline
 1728 \\
 3456 \\
 \hline
 4542 \\
 3456 \\
 \hline
 10860 \\
 10868 \\
 \hline
 492
 \end{array}$$

Single Rule

22. At 22l. 8s. per ton. what
will 203t. 9cwt. 3qtr. 3lb. of tobacco
come to: Ans. 4558.8s.

$$\begin{array}{r}
 \text{of L S of} \quad \text{cwt qtr lb} \\
 1 : 22 : 8 :: 203 : 7 : 3 : 3 \\
 \hline
 20 \quad 20 \quad 4069 \\
 20 \quad 448 \quad 16279 \\
 4 \quad 28 \\
 80 \quad 130235 \\
 28 \quad 32558 \\
 640 \quad 455805 \\
 160 \quad 448 \\
 \hline
 2240
 \end{array}$$

$$\begin{array}{r}
 3646520 \\
 1823260 \\
 1823260 \\
 2240 \quad 204205120 \quad (91163) \\
 20160 \quad 4558.83 \\
 \hline
 2605 \\
 2240 \\
 \hline
 11112 \\
 13440 \\
 \hline
 6420 \\
 6420
 \end{array}$$

$$\begin{array}{r}
 28 \quad 2240 \\
 7 \quad 320 \\
 11 \quad 80 \\
 20 \quad 20 \\
 \hline
 20 \quad 1=0
 \end{array}
 \quad
 \begin{array}{r}
 20 \quad 1118 \\
 22=8
 \end{array}$$

23. If 850 dolls. 50 cents is paid
for 18 pieces of cloth at the rate
of 11 dollars 25 cents for 5 yards.
how many yards were in each piece.
allowing a equal number to each
piece: Ans. 21 yds.

$$\begin{array}{r}
 11,25 : 5 :: 850,50 \\
 11,25 \quad 425250 \quad (378) \\
 3345 \\
 8445 \\
 4845 \\
 \hline
 9000 \\
 9000
 \end{array}$$

$$\begin{array}{r}
 18 \quad 378 \quad (21 \text{ Ans}) \\
 36 \\
 \hline
 18 \\
 18
 \end{array}$$

24. If 12 1/2 yards of muslin cost
1l. 17s. 6d. what is it per yard.

Ans. 3s.

$$\begin{array}{r}
 \text{Sub L S d yard} \\
 12.5 : 1 : 17 : 6 : 1.0 \\
 \hline
 20 \\
 37 \\
 12 \\
 \hline
 450 \\
 1.0 \\
 12.5 \quad 450.0 \quad (36) \\
 375 \\
 \hline
 450 \\
 450
 \end{array}$$

$$\begin{array}{r}
 12 \quad 36 \\
 \hline
 3 \text{ Ans}
 \end{array}$$

25. If a staff 4 feet long cast a
shadow on level ground 4 feet
long. what is the height of a steeple
whose shade at the same time
is 218 feet 9 inches: Ans. 125 feet.

$$\begin{array}{r}
 \text{ft ft ft in} \\
 4 : 4 :: 218 : 9 \\
 12 \quad 12 \\
 \hline
 84 \quad 2625 \\
 84 \quad 10500 \quad (125) \\
 84 \\
 \hline
 210 \\
 168 \\
 \hline
 420 \\
 420
 \end{array}$$

Continued

26. If $\$1292$ dollars $32\frac{1}{2}$ cents
are paid for 1176 acres 3 roods
 28 perches of land. how much
is it per acre:

146.3.28: 14292325:: 1
 1904 160
 110 110
 46308 150
 686772 900
 00

27. If a man's annual income be 1333 dollars, and he expend daily 2 dollars and 14 cents, how much will he save at the end of the year.
Ans. 551 dolls. 90 cts.

$$\begin{array}{r}
 1233,00 \\
 781,10 \\
 \hline
 551,90
 \end{array}$$

28. If 321 bushels of wheat cost
240 dollars 75 cents. what is it
per bushel: Ans. 75 cts.



$$\begin{array}{r} \text{Bu} \qquad \qquad \text{PC} \qquad \qquad \text{Bu} \\ 321 : 24075 :: 1 \\ \hline 75 \overline{) 321} \quad 24075 \overline{) 75} \\ 1605 \quad \underline{2247} \\ 2247 \quad \underline{1605} \\ \hline 24075 \quad \underline{1605} \end{array}$$

29. If $1\frac{1}{2}$ yards of cloth cost 2 dollars
50 cents. what will 1 quarter 2 na
ils come to: Ans. 62 $\frac{1}{2}$ cts.

yard: 76. gr. ma
 $\frac{1\frac{1}{2}}{4} : 250 :: \frac{1.2}{4}$
 $\frac{6}{4} \quad \frac{6}{1500} \quad \frac{6}{6}$
 $\frac{24}{24}$

$$\begin{array}{r} 24 \overline{) 1500} \quad (62\frac{1}{2}) \\ \underline{144} \\ 60 \\ \underline{48} \\ 12 \\ \underline{12} = 1 \\ 24 = 2 \end{array}$$

30. Bought 3 pipes of wine containing $120\frac{1}{2}$,
 124 , and $126\frac{3}{4}$ gallons, at 5s. 6d. per
 gallon; what do they cost:
 Ans. 102 l. 1s. $10\frac{1}{2}$ d.

gal gal

$1 : 5.6 :: 120 \frac{1}{4}$

$\frac{H}{H} \quad \frac{12}{66}$

$\frac{H}{H} \quad \frac{H}{H}$

$1485 \quad 26H$

$26H$

5940

8240

2940

$H) 2920H0$

$H) 28010$

$24502=2$

$12) 20H(1=10$

$20) 102=1=10\frac{1}{2}$

The Single Rule

The Single Rule

31. A sets out from a certain place and goes 12 miles a day: 5 days after B sets out from the same place, the same way, and goes 16 miles a day; in how many days will he overtake A? Ans. 15 days.

$$\begin{array}{r} M \quad D \quad M \\ 12 : 1 :: 106 \\ \hline 60 \\ \hline 15 \end{array}$$

32. If I have owing to me 1000l. and compound with my debtor, at 12s. 6d. per pound, how much must I receive? Ans. 625l.

$$\begin{array}{r} L \quad S \quad D \quad L \\ 1 : 12.6 :: 1000 \\ \hline 12 \\ 150 \quad 12 \quad 150000 \\ \hline 20 \quad 12500 \\ \hline 625 \end{array}$$

33. if 365 men consume 45 barrels of pork in 9 months. how many will 500 men consume in the same time? Ans. 102 $\frac{54}{73}$ barrels.

$$\begin{array}{r} Men. \quad Barls \quad Men \\ 365 : 45 :: 500 \\ \hline 365 \quad 37500 \quad 102 \\ \hline 1000 \\ 730 \\ \hline 5 \quad 270 \quad 54 \\ \hline 365 \quad 73 \end{array}$$

34. How much land at 2 dollars 50 cents per acre, must be given in exchange for 360 acres, at 2 dollars 75 cents? Ans. 540 acres.

$$\begin{array}{r} D \quad C \quad A \quad D \quad C \\ 2.50 : 360 :: 375 \\ \hline 360 \\ \hline 22500 \\ 1125 \\ \hline 250 \quad 135000 \quad 540 \\ \hline 1250 \\ \hline 1000 \\ \hline 1000 \\ \hline 0 \end{array}$$

35. If the earth, which is 360 degrees in circumference, turns round on its axis in 24 hours, how far are the inhabitants at the equator carried in one minute, a degree there being 69 $\frac{1}{2}$ miles?

Ans. 17 miles 3 furl.

$$\begin{array}{r} D \quad C \quad Deg \quad Mi \\ 24 : 360 :: 1 \\ \hline 60 \quad 69.5 \\ \hline 1440 \quad 1800 \\ 3240 \\ \hline 2160 \\ \hline 1440 \quad 250200 \quad 17.3 \\ \hline 1440 \\ \hline 10620 \\ \hline 10080 \\ \hline 540 \\ \hline 8 \\ \hline 1440 \quad 4320 \quad 3 \\ \hline 4320 \end{array}$$

The Single Rule of Three Inverse

1. If 20 men can build a wall in 12 days. how long will it require 40 men to build the same:

$$\begin{array}{l} \text{As } 20 : 12 :: 40 \text{ } \\ \hline 20 \text{ } \end{array} \text{proof. } \begin{array}{l} \text{As } 40 : 12 :: 20 \text{ } \\ \hline 40 \text{ } \end{array}$$

Ans. 6 days.

5. If 5 dollars is paid for the carriage of 1 cwt. weight 150 miles. how far may 6 cwt. weight be carried for the same money:

Ans. 25 miles.

$$\begin{array}{l} \text{cwt } 1 : 150 :: 6 \\ \hline 6 \overline{) 150} \\ 25 \end{array}$$

2. If 60 men can build a bridge in 100 days, how long will it require 20 men to build it:

Ans. 300 days.

$$\begin{array}{l} \text{As } 60 : 100 :: 20 \text{ } \\ \hline 60 \overline{) 1000} \\ 20 \end{array} \text{ } \begin{array}{l} \text{As } 20 : 300 :: 60 \text{ } \\ \hline 20 \overline{) 6000} \\ 60 \end{array}$$

6. If a street 80 feet wide and 300 yards long. can be paved by 40 men in 20 days, what length will one of 60 feet wide, be paved by the same men in the same time:

$$\begin{array}{l} \text{ft. } 80 : 300 :: 60 \\ \hline 80 \overline{) 3000} \\ 300 \end{array}$$

3. If a wall 100 yards long requires 65 men 4 days. in what time would 5 men complete it:

Ans. 52 days.

$$\begin{array}{l} \text{As } 65 : 4 :: 5 \text{ } \\ \hline 65 \overline{) 20} \\ 10 \end{array} \text{ } \begin{array}{l} \text{As } 5 : 52 :: 65 \text{ } \\ \hline 5 \overline{) 260} \\ 52 \end{array}$$

7. If a field that is 30 rods wide and 80 in length, contain 15 acres. how wide must one be. to contain the same quantity. that is but 40 rods long:

Ans. 3 R. 4 ft. 8 in.

$$\begin{array}{l} \text{length } 80 : 30 :: 40 \\ \hline 80 \overline{) 300} \\ 30 \end{array}$$

8. if a barrel of flour will last a family of 6 persons 24 days. how long would it last if 3 more were added to the family: Ans. 16 days.

$$\begin{array}{l} \text{Persons } 6 : 24 :: 9 \\ \hline 6 \overline{) 24} \\ 24 \end{array}$$

$$\begin{array}{l} 9 \overline{) 144} \\ 16 \end{array}$$

$$\begin{array}{l} 40 \overline{) 2400} \\ 210 \quad 34 \dots 4 \dots 8 \frac{4}{4} \\ \hline 300 \\ 280 \\ \hline 20 \\ 16 \frac{1}{2} \\ \hline 320 \\ 280 \text{ ft} \\ \hline 40 \\ 12 \\ \hline 600 \text{ } 8 \frac{4}{4} \text{ in} \\ \hline 410 \\ 410 \end{array}$$

Single Rule of Three Inverse

8. If a board be 75 of a foot wide, what length must it be to measure 12 square feet: Ans. 16 feet.

$$\begin{array}{r} \text{ft} \quad \text{ft} \quad \text{ft} \\ 1 : 12 :: 75 \\ \hline 75 \overline{) 1200} 16 \\ \underline{75} \\ 450 \\ \underline{450} \end{array}$$

9. How much cloth 125 quarters wide, can be lined by 12,5 yards of silk that is, 75 of a yard wide:

Ans. 25,5 yards.

$$\begin{array}{r} \text{yds} \quad \text{yds} \quad \text{qr} \\ 75 : 12,5 :: 125 \\ \hline 42,5 \\ \hline 375 \\ \hline 150 \\ \hline 300 \\ \hline 1,250 \overline{) 31875} 25,5 \\ \underline{2500} \\ 6875 \\ \underline{6250} \\ 6250 \\ \underline{6250} \end{array}$$

10. If 10 men could complete a building in 4,5 months. what time would it require if 5 more were employed: Ans. 3 months.

$$\begin{array}{r} \text{men} \quad \text{men} \quad \text{men} \\ 10 : 15 :: 4,5 \\ \hline 10 \\ \hline 15 \overline{) 45} 3 \end{array}$$

11. In what time will 600 dollars gain 50 dollars. when 80 dollars would gain it in 15 years: Ans. 2 years.

$$\begin{array}{r} \text{dollars} \quad \text{years} \\ 80 : 15 :: 600 \\ \hline 80 \\ \hline 600 \overline{) 1200} 2 \text{ years} \\ \underline{1200} \end{array}$$

12. If a traveller can perform a journey in 11 days. when the days are 12 hours long, what time will he require when the days are 16 hours long: Ans. 3 days.

$$\begin{array}{r} \text{h} \quad \text{D} \quad \text{h} \\ 12 : 11 :: 16 \\ \hline 11 \\ \hline 16 \overline{) 48} 3 \text{ days} \\ \underline{48} \end{array}$$

13. Suppose 100 men in a garrison are supplied with provisions for 30 days. how many men must be sent out if they would have the provisions last 50 days: Ans. 160 men.

$$\begin{array}{r} \text{M} \quad \text{D} \\ 30 : 50 :: 100 \\ \hline 100 \\ \hline 50 \overline{) 12000} 240 \\ \underline{100} \\ 200 \\ \underline{200} 0 \end{array} \quad \begin{array}{r} 100 \\ 240 \\ \hline 160 \text{ men} \end{array}$$

Single Rule of Three Inverse

14. Lent a friend 292 dollars for 6 months; afterwards I borrow from him 806 dollars: how long may I keep it to balance the favor?

Ans. 2 months 5 days.

D M D

$$292 : 6 :: 806$$

$$806 \overline{) 1752} \left(2 \frac{1}{2} \text{ Months} \right.$$

$$806 \overline{) 4200} \left(5 \text{ days} \right.$$

15. 1200 men stationed in a garrison have provisions for 9 months at the rate of 14 ounces per day; how long at the same allowance will the same provisions last if they are reinforced by 400 men. And also what diminution must be made on each ration, that the provisions may last for the same time: Ans. $6\frac{3}{4}$ months at the same allowance - $3\frac{1}{2}$ oz. deduction to last for the same time.

$$\begin{array}{ccc} \text{Men} & \text{Mo} & \text{Men} \\ 1200 & : 9 & :: 1600 \end{array}$$

$$1600 \overline{) 10800} \left(6\frac{3}{4} \text{ Months} \right.$$

$$4 \overline{) 1200} \left(3 \right.$$

$$\begin{array}{ccc} \text{Men} & \text{oz} & \text{Men} \\ 1200 & : 14 & :: 1600 \end{array}$$

$$1600 \overline{) 16800} \left(10\frac{1}{2} \right.$$

16. If a piece of land 110 rods in length and 11 in breadth. make an acre. how wide must it be if it is but 25 rods long: Ans. $6\frac{2}{5}$ rods.

$$\begin{array}{ccc} R & R & R \\ 11 & : 110 & :: 25 \\ 25 \overline{) 160} & \left(6\frac{2}{5} \text{ rods} \right. & \\ 150 & & \\ \hline 10 & = 2 & \\ 5 \overline{) 25} & = 5 & \end{array}$$

17. How much in length that is 3 inch is broad, will make a square foot: Ans. 48 inches.

$$\begin{array}{ccc} \text{in} & \text{in} & \text{in} \\ 12 & : 12 & :: 3 \\ 12 \overline{) 144} & & \\ 48 & \text{in} & \end{array}$$

18. If a pasture field will feed 6 cows 91 days. how long will it feed 21 cows: Ans. 26 days.

$$\begin{array}{ccc} \text{cows} & \text{days} & \text{cows} \\ 6 & : 91 & :: 21 \\ 21 \overline{) 546} & \left(26 \right. & \\ 42 & & \\ \hline 126 & & \\ 126 & & \end{array}$$

19. There is a cistern having 1 pipe. which will empty it in 10 hours; how many pipes of the same capacity will empty it in 24 minutes: Ans. 25 pipes.

$$\begin{array}{ccc} H & P & Mi \\ 10 & : 1 & :: 24 \\ 60 & & \\ \hline 600 & & \\ 24 \overline{) 600} & \left(25 \right. & \\ 48 & & \\ \hline 120 & & \\ 120 & & \end{array}$$

Sixth Rule of Share Money

20. How many yards of carpeting that is half a yard wide. will cover a floor that is 30 feet long and 18 feet wide: Ans. 120 yards.

$$\begin{array}{r} \text{ft} \quad \text{ft} \quad \text{ft} \\ 300 : 18 :: 1.5 \\ 1.5 \overline{) 300} \quad 3 \overline{) 360} \\ \underline{45} \quad \underline{120} \text{ yards Ans} \\ 90 \\ 0 \end{array}$$

$$\begin{array}{r} M \quad D \quad M \\ 100 : 5 :: 25 \\ 25 \overline{) 500} \quad (20 \text{ days} \\ \underline{50} \\ 0 \end{array}$$

22

$$\begin{array}{r} D \quad M \quad D \\ 20 : 25 : 1 \\ \underline{20} \\ 500 \text{ miles} \end{array}$$

20 days

21. What is the weight of a pea to a steelyard, which being suspended 39 inches from the centre of motion. will equilibrate 208 lb. suspended at the draught end $\frac{3}{4}$ of an inch: Ans. 4 lb.

$$\begin{array}{r} \text{in} \quad \text{lb} \quad \text{in} \\ \frac{3}{4} : 208 :: 39 \\ \underline{75} \\ 1040 \\ 1456 \\ 3900 \overline{) 15600} \quad 40 \\ \underline{15600} \end{array}$$

22. A and B depart from the same place, and travel the same road; but A goes 5 days before B at the rate of 20 miles a day. B follows at the rate of 25 miles a day: in what time, and at what distance will he overtake A:

Ans. 20 days, and 500 miles.

James McCormick

Single Rule of Three, Inverse

General Rule.

1. If 30 horses plough 12 acres. how many will 40 horses plough in the same time:

$$\begin{array}{rcl} h & h & \text{acr} \\ 30 : 40 :: 12 & & \\ \hline 30 \overline{) 480} & (16 \text{ acres. Ans} & \\ \underline{30} & & \\ 180 & & \\ \underline{180} & & \end{array}$$

$$\begin{array}{rcl} \text{gal} & \text{gal} & D \\ \text{lost } 63 : 1 :: 119 & & \\ \underline{54} & & \underline{131} \text{ gain} \\ & & 1 \\ 54 \overline{) 131} & (2.425 & \\ \underline{108} & & \\ 230 & & \\ \underline{216} & & \\ 140 & & \\ \underline{108} & & \\ 320 & & \\ \underline{270} & & \\ 50 & & \end{array}$$

2. If 30 horses plough 12 acres in 10 days; in how many days will 40 horses plough the same quantity:

Operation.

$$\begin{array}{rcl} h & h & D \\ 40 : 30 :: 10 & & \\ \hline 40 \overline{) 300} & (7.5 \text{ days. Ans.} & \\ \underline{280} & & \\ 200 & & \\ \underline{200} & & \end{array}$$

5. If 225 pounds be carried 512 miles for 20 dollars. how many pounds may be carried 64 miles for the same money: Ans. 1800 lb.

$$\begin{array}{rcl} M & M & L \\ 64 : 512 :: 225 & & \\ \hline & 512 & \\ & \underline{450} & \\ & 225 & \\ & \underline{1125} & \\ 64 \overline{) 11520} & (1800 & \\ \underline{64} & & \\ 512 & & \\ \underline{512} & & \\ 00 & & \end{array}$$

3. If 800 soldiers in a garrison have provisions sufficient for 2 months: how many must depart that the provisions may last them for 5 months: Ans. 480

$$\begin{array}{rcl} M & M & \\ 5 : 2 :: 800 & & \\ \hline 5 \overline{) 1600} & & \\ \underline{800} & & \\ 800 & & \\ \underline{320} & & \\ 480 & & \end{array}$$

6. If 8 dollars 5 cents be assessed on 1750 dolls. what is the tax of 10 dollars at the same rate:

Ans. 50 cents.

$$\begin{array}{rcl} D & D & D \\ 1750 : 87.50 :: 10 & & \\ \hline 1750 \overline{) 87500} & (50 & \\ \underline{8750} & & \\ 0 & & \end{array}$$

4. Bought a hoghead of Madeira wine for 119 dollars. nine gallons of which leaked out, what is the remainder sold at per gallon, to gain 12 dollars on the whole: Ans. 2 dollars. 42½ cts.

The Simple Rule of Three

1. If 6 men in 8 days earn 100 dollars. how much will 12 men earn in 24 days:

$$\begin{array}{r}
 288 \\
 \underline{100} \\
 600 \overline{) 28800} \text{ (18 proof 48)} \\
 \underline{2400} \\
 4800 \\
 \underline{4800} \\
 0
 \end{array}
 \quad
 \begin{array}{l}
 6 \text{ men} \\
 8 \text{ days} : 100 :: \left\{ \begin{array}{l} 12 \text{ men} \\ 24 \text{ days} \end{array} \right.
 \end{array}
 \quad
 \begin{array}{r}
 288 \\
 \underline{100} \\
 28 \overline{) 28800} \text{ (600 dolls. Ans)} \\
 \underline{288} \\
 00
 \end{array}$$

2. If 10 bushels of oats suffice 18 horses for 20 days. how many bushels will serve 60 horses 36 days: Ans. 60 bushels.

$$\begin{array}{r}
 18 \text{ horses} \\
 20 \text{ days} : 10 :: \left\{ \begin{array}{l} 60 \text{ horses} \\ 36 \text{ days} \end{array} \right. \\
 \underline{360} \quad \underline{360} \\
 \quad 180 \\
 \quad \underline{2160} \\
 360 \overline{) 21600} \text{ (60 bushels)} \\
 \underline{2160} \\
 0
 \end{array}$$

3. If 56 pounds of bread will suffice 7 men 14 days. how much bread will serve 21 men 3 days: Ans. 36 pounds.

$$\begin{array}{r}
 7 \text{ men} \\
 14 \text{ days} : 56 :: \left\{ \begin{array}{l} 21 \text{ men} \\ 3 \text{ days} \end{array} \right. \\
 \underline{28} \quad \underline{63} \\
 \quad 7 \quad \underline{56} \\
 \quad \underline{98} \quad \underline{348} \\
 \quad \quad 315 \\
 98 \overline{) 3528} \text{ (36 pounds)} \\
 \underline{294}
 \end{array}$$

Double Rule of Three

4. If 8 students spend 384 dollars in 6 months. how much will maintain 12 students 10 months:

Ans. 960 dollars.

$$\begin{array}{r}
 \begin{array}{l} 8 \text{ students} \\ 6 \text{ months} \end{array} : 384 :: \begin{array}{l} 12 \text{ students} \\ 10 \text{ months} \end{array} \\
 \hline
 48 \quad \begin{array}{r} 120 \\ 384 \\ \hline 480 \\ 960 \\ 360 \\ 360 \\ \hline 360 \end{array} \\
 48 \overline{) 46080} \quad (960 \text{ dolls} \\
 \underline{432} \\
 288 \\
 \underline{288} \\
 0
 \end{array}$$

6. If 14 dollars interest is gained by 100 dollars in 6 months. what will be the interest of 400 dollars for 5 years:

Ans. 80 dollars.

$$\begin{array}{r}
 \begin{array}{l} 100 \text{ dollars} \\ 6 \text{ months} \end{array} : 14 :: \begin{array}{l} 400 \text{ dollars} \\ 5 \text{ years} \end{array} \\
 \hline
 4200 \quad \begin{array}{r} 60 \\ 24000 \\ 14 \\ \hline 96000 \\ 24000 \\ \hline 336000 \\ 33600 \\ \hline 0 \end{array} \\
 4200 \overline{) 336000} \quad (80 \text{ dolla}
 \end{array}$$

5. If 20 hundred weight is carried 50 miles for 25 dollars. how much must be given for the carriage of 40 hundred weight 100 miles:

Ans. 100 dollars.

$$\begin{array}{r}
 \begin{array}{l} 20 \text{ hundred} \\ 50 \text{ miles} \end{array} : 25 :: \begin{array}{l} 40 \text{ hundred} \\ 100 \text{ miles} \end{array} \\
 \hline
 1000 \quad \begin{array}{r} 1000 \\ 25 \\ \hline 20000 \\ 8000 \\ \hline 100000 \\ 10000 \\ \hline 00 \end{array} \\
 1000 \overline{) 100000} \quad (100
 \end{array}$$

7. If 4 men can do 12 rods of ditching in 6 days. how many rods may be done by 8 men in 24 days: Ans. 96 rods.

$$\begin{array}{r}
 \begin{array}{l} 4 \text{ men} \\ 6 \text{ days} \end{array} : 12 :: \begin{array}{l} 8 \text{ men} \\ 24 \text{ days} \end{array} \\
 \hline
 24 \quad \begin{array}{r} 132 \\ 16 \\ \hline 192 \\ 12 \\ \hline 2304 \\ 216 \\ \hline 144 \\ 144 \\ \hline 0 \end{array} \\
 24 \overline{) 2304} \quad (96 \text{ rods.}
 \end{array}$$

Double Rule of Three

Inverse Proportion.

1. If 4 dollars pay 8 men for 3 days: how many days must 20 men work for 40 dollars:

$$\begin{array}{l} 4 \text{ dollars } \{ \text{days} \\ 8 \text{ men} \end{array} : 3 :: \begin{array}{l} 40 \text{ dollars} \\ 20 \text{ men} \end{array}$$

$$\begin{array}{r} 384 \\ 160 \\ \hline 160 \end{array}$$

3. If 4 men are paid 24 dollars for 3 days work, how many men may be employed 16 days for 96 dollars: Ans. 3 men.

$$\begin{array}{l} 3 \text{ days } \{ \text{men} \\ 4 \text{ men} \end{array} : 24 \text{ dollars} :: \begin{array}{l} 16 \text{ days} \\ 96 \text{ dollars} \end{array}$$

$$\begin{array}{r} 144 \\ 24 \\ \hline 384 \end{array}$$

$$\begin{array}{r} 288 \\ 1152 \\ \hline 1152 \end{array}$$

3 men Ans.

1. Here the lower line is inverse, which transposed will stand thus.

$$\begin{array}{l} 4 \text{ dollars } \{ \text{days} \\ 20 \text{ men} \end{array} : 3 :: \begin{array}{l} 40 \text{ dollars} \\ 8 \text{ men} \end{array}$$

$$\begin{array}{r} 80 \\ 320 \\ \hline 960 \\ 80 \\ \hline 160 \\ 160 \end{array}$$

12 days Ans

4. If 7 men can reap 84 acres of grain in 12 days, how many men can reap 100 acres in 5 days: Ans. 20 men.

$$\begin{array}{l} 84 \text{ acres } \{ \text{men} \\ 12 \text{ days} \end{array} : 7 :: \begin{array}{l} 100 \text{ acres} \\ 5 \text{ days} \end{array}$$

$$\begin{array}{r} 420 \\ 5 \\ \hline 420 \end{array}$$

$$\begin{array}{r} 1200 \\ 8400 \\ \hline 8400 \end{array}$$

20

2. If 4 men are paid 24 dollars for 3 days work, how many days may 16 men be employed for 384 dollars: Ans. 12 days.

$$\begin{array}{l} 4 \text{ men } \{ \text{days} \\ 24 \text{ dollars} \end{array} : 3 :: \begin{array}{l} 16 \text{ men} \\ 384 \text{ dollars} \end{array}$$

$$\begin{array}{r} 16 \\ 384 \\ \hline 1536 \\ 384 \\ \hline 4608 \\ 384 \\ \hline 768 \\ 768 \end{array}$$

12 days

5. If 7 men can reap 84 acres of grain in 12 days, how many days will it require 20 men to reap 100 acres: Ans. 5 days.

$$\begin{array}{l} 7 \text{ men } \{ \text{days} \\ 84 \text{ acres} \end{array} : 12 :: \begin{array}{l} 20 \text{ men} \\ 100 \text{ acres} \end{array}$$

$$\begin{array}{r} 1680 \\ 20 \\ \hline 1680 \end{array}$$

$$\begin{array}{r} 700 \\ 12 \\ \hline 8400 \\ 8400 \end{array}$$

5 days Ans

J. S. M.

Double Rule of Three

6. If 40 cents are paid for the carriage of 200 pounds for 40 miles, how far may 20200 pounds be carried for 60 dollars 60 cents:

Ans. 60 miles.

40 cents 2 miles 60 60 cents
200 pounds } 40 :: 20200 pounds

$$\begin{array}{r} 40 \\ 20200 \\ \hline 8000 \\ 800 \\ \hline 808000 \end{array} \quad \begin{array}{r} 6060 \\ 200 \\ \hline 1212000 \\ 40 \\ \hline 48480000 \\ 4848000 \end{array} \quad \begin{array}{r} 60 \\ 14=2 \end{array}$$

Promiscuous Questions

1. If 12 oxen in 8 days eat 10 acres of clover, how many acres will serve 24 oxen 48 days

Ans. 120 acres

12 oxen 2 acres 8 days } 24 oxen
8 days } 10 :: 28 days

$$\begin{array}{r} 96 \\ 192 \\ 96 \\ \hline 11520 \\ 96 \overline{) 11520} \quad 120 \\ \hline 192 \\ 192 \end{array}$$

7. If 5 men spend 200 dollars in 22 weeks and 6 days, how long will 300 dollars support 12 men:

Ans. 14 weeks 2 days.

5 men 22 6 days 12 men
200 dollars } 22 6 :: 300 dollars

$$\begin{array}{r} 12 \\ 2400 \\ \hline 1500 \\ 160 \\ \hline 90000 \\ 1500 \\ \hline 240000 \\ 2400 \end{array} \quad \begin{array}{r} 5 \\ 1500 \\ 160 \\ \hline 90000 \\ 1500 \\ \hline 240000 \\ 2400 \end{array} \quad \begin{array}{r} 100 \\ 14=2 \end{array}$$

2. A person having engaged to remove 8000 weight 15 miles in 9 days; with 18 horses in 6 days, he removed 4500 weight: how many horses will be necessary to remove the rest, in the remaining 3 days:

Ans. 28 horses

cwt. 4500 } horses 8000
days 6 } 18 :: 3 days

$$\begin{array}{r} 3 \\ 13500 \\ \hline 21000 \\ 18 \\ \hline 13500 \overline{) 21000} \quad 28 \\ \hline 27000 \\ 108000 \\ 108000 \end{array}$$

Continued R S

3. If the carriage of 9 hogsheds of suar, each weighing 12 cwt. for 60 miles cost 100 dollars, what must be paid for the carriage of 50 barrels of sugar, each weighing 2.5 cwt. 300 miles: *Ans.* 578¹/₂ dolls. 70 + cents.

$$\begin{array}{r}
 \begin{array}{l}
 \text{cwt } 108 \\
 \text{miles } 60
 \end{array}
 \left. \begin{array}{l}
 12 \\
 9
 \end{array} \right\} \text{dollars } 100 \\
 \hline
 6480
 \end{array}
 \begin{array}{l}
 : 100 :: \\
 125.0 \text{ cwt} \\
 300 \text{ miles}
 \end{array}
 \left. \begin{array}{l}
 50 \\
 2.5
 \end{array} \right\}
 \begin{array}{r}
 1250 \\
 12500 \\
 3750000 \\
 32400 \\
 51000 \\
 45360 \\
 56400 \\
 51840 \\
 45600 \\
 45360 \\
 \hline
 2400
 \end{array}
 \begin{array}{r}
 3750000 \\
 32400 \\
 51000 \\
 45360 \\
 56400 \\
 51840 \\
 45600 \\
 45360 \\
 \hline
 2400
 \end{array}
 \begin{array}{r}
 578,70
 \end{array}$$

4. If a cellar which is 22.5 feet long, 17.3 feet wide, and 10.25 deep is dug by 6 men in 2.5 days, working 12.3 hours each day; how many days of 8.2 hours will it require 9 men to dig one, which is 45 feet long, 34.6 wide and 12.3 deep: *Ans.* 12 days:

$$\begin{array}{r}
 \begin{array}{l}
 22.5 \text{ length} \\
 17.3 \text{ breadth} \\
 10.25 \text{ depth}
 \end{array}
 \left. \begin{array}{l}
 6 \text{ men} \\
 2.5 \text{ days} \\
 12.3 \text{ hours}
 \end{array} \right\}
 \begin{array}{r}
 675 \\
 1575 \\
 225 \\
 389.25 \\
 1946.25 \\
 4785.0 \\
 38925.0 \\
 39898.125 \\
 239388.750 \\
 478777.500 \\
 2393887.50 \\
 294448.16250
 \end{array}
 \end{array}
 : 2.5 ::
 \begin{array}{r}
 \begin{array}{l}
 45 \text{ length} \\
 34.6 \text{ breadth} \\
 12.3 \text{ depth}
 \end{array}
 \left. \begin{array}{l}
 9 \text{ men} \\
 8.2 \text{ hours}
 \end{array} \right\}
 \begin{array}{r}
 346 \\
 270 \\
 180 \\
 135 \\
 1557.0 \\
 4671.0 \\
 3114.0 \\
 1557.0 \\
 19151.10 \\
 172359.90 \\
 3447198.0 \\
 13488792.0 \\
 1413351.180 \\
 2.5 \\
 4066755.400 \\
 28267023.60 \\
 3538377.95000 \\
 29444816.250 \\
 58889632.500 \\
 58889632.500
 \end{array}
 \end{array}
 \begin{array}{r}
 12 \text{ days}
 \end{array}$$

Practice

James Mornick
September the 21 day 1822

Examples.

1. What will 175 pounds of tea come to at 1 dollar 30 cents and 5 mills per pound:

130.5	cts.	175
175	Or. 25 $\frac{1}{4}$	4375
6525	5 $\frac{1}{5}$	875
9135	5m $\frac{1}{10}$	875
305		228,375

228 375 Ans. 228 dolls. 37 cts. 5 mills

yards

625	Ans C
25 $\frac{1}{4}$ 156,25	

yards

8275	Ans.
11 $\frac{1}{25}$ 331	
11m $\frac{1}{10}$ 3310	
	364,10

yards

8275	Ans
5m $\frac{1}{200}$ 800	
	275
	200
	750
	600
	1500
	1400
	1000
	1000

250

50	$\frac{1}{2}$	250
25	$\frac{1}{2}$	125
75	$\frac{1}{2}$	6250
		437,50 Ans

201

20	$\frac{1}{5}$	804
		4020
		844,20 Ans

yards

2210	Ans
10 $\frac{1}{10}$ 2210	
	22100
	2431,00

yards

421	Ans
20 $\frac{1}{5}$	842
20 $\frac{1}{5}$	842
20 $\frac{1}{5}$	842
1 $\frac{1}{20}$	421
5m $\frac{1}{2}$	2105
	1016,71.5 Ans

1. What will 375 yards of mus cost at $\frac{3}{4}$ of a dollar per yard:

375 at $\frac{3}{4}$

3	
4 1125	
	281.25 Ans.

P Practice P

$$\begin{array}{r}
 2 \text{ cwt } 11 \text{ qr } 14 \text{ lb } \frac{1}{4} \\
 \underline{11} \\
 17 \\
 \underline{28} \\
 140 \\
 \underline{35} \\
 11490 \\
 \hline
 122,50 \text{ Ans}
 \end{array}$$

2

Application

1. Bought 6 hog heads of tobacco each weighing 125 cwt. at $\frac{2}{8}$ of a dollar per pound: what did it cost: Ans. 3150 doll.

$$\begin{array}{r}
 \text{hhd} \quad \text{cwt} \quad \text{dollar} \\
 6 \quad 12.5 \quad \frac{2}{8} \\
 \underline{6} \\
 75.0 \\
 \hline
 300 \\
 \underline{28} \\
 2400 \\
 \underline{600} \\
 8400 \\
 \hline
 8 \overline{) 25200} \\
 \underline{3150}
 \end{array}$$

$$\begin{array}{r}
 3 \text{ cwt } 12 \text{ qr } 13 \text{ lb } \frac{3}{4} \\
 \underline{12} \\
 50 \\
 \underline{28} \\
 413 \\
 \underline{100} \\
 1413 \\
 \underline{2} \\
 3 \overline{) 2826} \\
 \underline{942}
 \end{array}$$

$$\begin{array}{r}
 11 \text{ cwt } 14 \text{ qr } 2 \text{ lb } \frac{7}{8} \\
 \underline{14} \\
 58 \\
 \underline{28} \\
 471 \\
 \underline{116} \\
 5 \overline{) 1631} \\
 \underline{3262} \\
 8 \overline{) 22834} \\
 \underline{285,12.5}
 \end{array}$$

2. A gentleman bought a vessel of 60 tons burthen. and gave at the rate of $2\frac{3}{5}$ eagles per ton: what did the vessel cost: Ans. 1560 doll.

$$\begin{array}{r}
 \text{t} \quad \text{eagles} \\
 6 \quad 2\frac{3}{5} \\
 \underline{2} \\
 120 \\
 \underline{36} \\
 156 \\
 \underline{10} \\
 1560
 \end{array}$$

$$\begin{array}{r}
 60 \\
 \underline{3} \\
 5 \overline{) 180} \\
 \underline{36}
 \end{array}$$

Practice Practice

3. A carpenter bought 12650 feet of boards at $10\frac{3}{4}$ dollars per thousand: what did they cost him: Ans. 137dolls. 56cts. $8\frac{1}{2}$

$$\begin{array}{r} 12650 \\ 8 \overline{) 88550} \\ \underline{1106875} \end{array}$$

DL
 1341
 5
 1912 1/4 6705
 33525
 70, 110, 25 Ans

Example

1. Bought 16 cwt. 1 qtr. 16 lb. of tobacco at 12 dollars 50 cents per hundred weight: what did it cost

		1244	
		16	
		<hr/>	
		7464	
		1244	
		<hr/>	
19ris	$\frac{1}{4}$	19904	
	$\frac{1}{4}$	311	
16.66	$\frac{1}{4}$	1777 $\frac{1}{4}$	
		<hr/>	
		263927 $\frac{1}{4}$	
		2	
			Ans. 23 dollars

11. 1 cwt. 0 gr. 14 lb. of sugar
at 15 dolls. 5 mills. per hun-
dred weight. Ans. 10 dolls. 58 cts.

		D	M
		15008	
ogr	$\frac{1}{7}$	10	5835
16lb	$\frac{1}{8}$		214357
2	$\frac{1}{2}$		267941
1			13397
			107,58.048

2. 17 cwt. 3 qr. 19 lb. of sugar at
10 dollars 94 cents per hundred
weight. Ans. 196 dolls. 11 cts.

$$\begin{array}{r}
 10,94 \\
 14 \\
 \hline
 7658 \\
 1094 \\
 \hline
 18598 \\
 544 \\
 2735 \\
 12645 \\
 39046 \\
 \hline
 196,0408 \text{ Ans}
 \end{array}$$

Practice

1. hat will 1548 yards come to at 15. 6d. per yard:

or 6d. $\frac{1}{2}$ 1548 at 1 shilling will be the sa

2274 one number of shillings.

20)6822 shillings

34112 = 909 dolls. 60cts.

2475 yards at 6 Soms. 154 13 11 = 420, 11 1/4

yards

443

6

6 $\frac{1}{2}$ 2838

236..6

78..10

20)3153..11

154013..11

3153

12

40)34840

420, 11 1/4

3397 do. 34 Ans. 66 3 11 =

Yards

397

3

11 $\frac{1}{3}$ 1191

132..11

20)1323..11

66..3..11

1. 159 1/4 lb. of coffee at 18 Ans 5 5 =

coffee

159 1/4

6 $\frac{1}{2}$ 159 1/4 3

79 = 4 1/2

26 1/2

20)2615 5

13..5..5

5. lb

658

12

20)4896

394 = 16 = 0 =

6. 4 1/2 yds of cloth at 16 Ans 596 0 0 =

yds

445

16

4470

445

20)11920

596..0..0 =

7. 969 do. 19 11 Ans 964 19 3 =

Do

969

19

8721

969

6 $\frac{1}{2}$ 18411

484 6

242 3

161 6

20)19294 3

964..19..3 =

Practic James McCormick

5 To 5 Do 5 D
 8. 3415 9 11 1/2 8 1 1/2 =

Do

3415
 1 1/2 3 3435
 1 2 3 8 11
 1 5 4 9 1/2
 348 28 1 1/2
 1741 = 8 = 1 1/2 =

9. 4567 do. 19 11 1/2 Ans 4557 9 8 1/2 = 10

Do

4567
 19

41103
 4567
 6 1/2 86743
 3 1/2 2283 6
 2 1/2 1141 9
 1/2 1/4 461 2 1/2
 190 3 1/2

11 1/2 (20) 9114(9 8 1/2
 4557 = 9 = 8 1/2 = Ans

Examples

1 What will 45 cwt. 2 qtr. 14 lb. of sugar come to at 36 s. 8 d. per hundred weight?

£ s d

3 4 9
 5 x 9 = 45

16 18 9

2 qtr 152 8 9
 14 lb 1 18 10 1/2
 8 5 1/2
 154 11 1 Ans

2. 345. 14 cwt. 2 qtr. 14 lb. of hemp at 89 s. 6 d. per ton.

Ans. 3370 £. 13 s. 2 d.

£ s d

89 6 1
 3 x 12 = 37

268 0 0
 12

3216 0 0
 89 6 8

330568
 44134
 14144
 2248
 112

3370 = 13 = 2 Ans

3. 345. 12 cwt. 3 qtr. 27 lb. of sugar at 8 s. 11 s. 5 d. per cwt.

Ans. 625 £. 11 s. 10 d.

£ s d

8 . 11 . 5
 6 x 12 = 72

51 8 6
 12

qtr 2 1/2 614 2 0 1/2
 1 1/2 4 5 8 1/2
 1/2 2 2 10 1/4
 1/2 1 1 5
 1/2 0 10 8 1/2
 1/2 0 6 1 1/4
 1/2 0 3 0 1/2

625 11 = 10 Ans

Practica

SS
3 17 6
 $12 \times 12 = 144$

11. 7t. 4art. 2gr. 21lb. of rice at
36. 17s. 6d. per cwt.

Ans. 560l. 13s. 3d.

SS
3 17 6
 $12 \times 12 = 144$

2	1	2	558	0	0
14	1	4	1	18	9
7	1	2	0	9	8 1/2
			0	4	10

560 = 13 = 3 1/4

5. 476 acres 3 roods 28 perches of land
at 36. 7s. 11d. per acre.

Ans. 1619l. 11s. 13d.

SS
3 17 6
 $11 \times 6 = 476$

R 2	1	2	1	6	16	8	4
P 1	1	2	1	0	13	11 1/2	
P 20	1	2	1	0	16	11 3/4	
8	1	2	1	0	8	5 1/2	
	1	2	1	0	3	4 1/4	

1619 = 11 = 1 3/4

6. 640 acres 2 roods perches at
10 dollars 55 cents per acre

Ans. 6458dolls. 59 1/2cts.

SS
 $1055 \times 10 = 640$
 10550×11
105500
6
633000
42200
645200
5275
131875
6458, 59.3.45

7. 229 acres 3 roods 18 perches at
18 dollars 50 cents per acre.

Ans. 4252dolls. 45 1/2cts

SS
 1850×9
 $10 = 229$
 18500×2
185000
2
370000
37000
16650
423650
925
4625
115625
925
4252, 45.6.25

SS

Section 2.

3. At 45 cents per pound. what will 4
barrels of in-digo come to, weighing
as follows:

$$\begin{array}{r}
 4 \\
 \hline
 60 \\
 28 \\
 \hline
 481 \\
 121 \\
 \hline
 1691 \\
 45 \\
 \hline
 8455 \\
 6764 \\
 \hline
 960,95
 \end{array}$$

Ans: neat 60 cwt. 1 q^r. 22 lb. Amount 80 dollars. 14 ¹/₂ cts.

$$\begin{array}{r} 59 \\ 14 \\ \hline \end{array} \quad \begin{array}{r} 1 \\ 24 \\ \hline \end{array} \quad \begin{array}{r} 9 \\ \hline \end{array}$$

42

	7	14	2	
--	---	----	---	--

$$\begin{array}{r} 28 \overline{) 101036} \\ \underline{84} \\ 170 9 = 0 = 2 \end{array}$$
$$\begin{array}{r} 168 \\ \underline{2} \end{array} \quad \begin{array}{r} 59 = 1 - 24 \\ \underline{9 \quad 0 \quad 2} \end{array}$$

$50 = 1 = 22$
 $\frac{16}{300}$
 50

95	14	800
14	2	42

$$\begin{array}{r} 4 \frac{1}{2} \\ 1 \frac{1}{4} \\ \hline 807,142 \end{array}$$

122



5. Sold 24 bags of coffee, each 2 cwt. 3 qr. 17 lb gross. tare 13 lb. per cwt. tree. 1/4 per 10 lb. what is the neat weight and what will it come to at 32 cents per pound.

Ans. 66 cwt. 2 qr. 11 lb. and comes to \$386.88

cwt qr lb
 48-1-11
 9 0 10
 69 1 1
 4
 274
 28
 2214
 554
 26)7757
 52
 255
 234
 217
 208
 19

cwt qr lb
 69 21 18
 2 2 18
 66 2 11

cwt qr lb
 2 3 14
 26 0 13
 48 1 11
 13
 234
 48
 101 1/4
 3 25
 0 8 125
 0 4 6 428
 28)1018
 84
 178
 168
 10
 36
 9=0=10

cwt qr lb
 66 2 11
 4
 266
 28

2129
 533
 4459
 32
 14918
 22377
 238688

James M. Currier
 P. S. S.

Simple interest

Case 1

1. What is the interest of 154 dollars for 1 year at 6 percent: Ans. 24 dollars 24 cts.

$$\begin{array}{r} 154 \\ 6 \\ \hline 27,24 \text{ Ans} \end{array}$$

2. Required the interest of the same sum for 5 years at the same rate Ans. 136 dollars 20 cts.

$$\begin{array}{r} 154 \\ 6 \\ \hline 2724 \\ 5 \\ \hline 136,20 \text{ Ans} \end{array}$$

3. Required the amount of the same sum for 5 years at the same rate: Ans. 590 dollars 20 cts.

$$\begin{array}{r} 154 \\ 6 \\ \hline 2724 \\ 5 \\ \hline 13620 \\ 15400 \\ \hline 590,20 \text{ Ans} \end{array}$$

4. What is the interest of 200 dollars for 2 years at 6 percent: Ans. 24 dollars

$$\begin{array}{r} 200 \\ 6 \\ \hline 1200 \\ 2 \\ \hline 2400 \text{ Ans} \end{array}$$

5. What is the interest of 1260 dollars for 4 years at 4 percent: Ans. 352 dollars 80 cts.

$$\begin{array}{r} 1260 \\ 4 \\ \hline 8820 \\ 4 \\ \hline 352,80 \text{ Ans} \end{array}$$

6. What is the amount of a note for 560 dollars for 3 years at 8 percent: Ans. 694 dollars 40 cts.

$$\begin{array}{r} 560 \\ 8 \\ \hline 4480 \\ 3 \\ \hline 13440 \\ 560,00 \\ \hline 694,40 \text{ Ans} \end{array}$$

7. What sum must be given to discharge a bond given for 1520 dollars on which there is 6 years interest at 5 percent: Ans. 5846 dollars

$$\begin{array}{r} 1520 \\ 5 \\ \hline 22600 \\ 6 \\ \hline 135600 \\ 152000 \\ \hline 5846,00 \text{ Ans} \end{array}$$

Handwritten flourish

Simple Interest

8. What is the amount of 400 dollars for 2 years. at 6 $\frac{1}{2}$ percent.

Ans. 452 dolls.

$$\begin{array}{r}
 400 \\
 6\frac{1}{2} \\
 \hline
 2400 \\
 200 \\
 \hline
 2600 \\
 2 \\
 \hline
 5200 \\
 40000 \\
 \hline
 45200 \text{ Ans}
 \end{array}$$

9. What is the interest of 4925 dolls for 9 years. at 4 $\frac{1}{2}$ percent:

Ans. 3324 dolls. 34 cts. 5 m.

$$\begin{array}{r}
 4925 \\
 4\frac{1}{2} \\
 \hline
 34475 \\
 24625 \\
 \hline
 369375 \\
 9 \\
 \hline
 3324375 \text{ Ans}
 \end{array}$$

10. What is the amount of 2500 dollars for 1 year. at 4 $\frac{3}{4}$ percent:

Ans. 2693 dolls. 75 cts.

$$\begin{array}{r}
 2500 \\
 4\frac{3}{4} \\
 \hline
 12500 \\
 14500 \\
 \hline
 14500 \\
 1937500 \\
 25000000 \\
 \hline
 26937500 \text{ Ans}
 \end{array}$$

[Decorative flourish]

SSS case 2. SSS

1. What is the interest of 264 dollars 50 cents for 1 year. at 6 percent: Ans. 15 dolls 5 cts.

$$\begin{array}{r}
 264.50 \\
 6 \\
 \hline
 1587.00 \text{ Ans}
 \end{array}$$

2. What is the interest of 468 dollars 22 cents and 5 mills for 1 year. at 8 percent: Ans. 37 dolls. 45 cts. 8 mills

$$\begin{array}{r}
 468.225 \\
 8 \\
 \hline
 374518.00 \text{ Ans}
 \end{array}$$

3. What is the interest of 364 dolls 50 cents for 5 years. at 6 percent. per annum: Ans 109 dollars 35 cents.

$$\begin{array}{r}
 364.50 \\
 6 \\
 \hline
 218700 \\
 1093500 \text{ Ans}
 \end{array}$$

4. What is the amount of a note for 1260 dollars 50 cents and 5 mills for 3 years. at 4 $\frac{1}{2}$ percent. per annum: Ans. 1544 dolls. 11 cents 5 m.

$$\begin{array}{r}
 1260.505 \\
 4\frac{1}{2} \\
 \hline
 6302525 \\
 8823535 \\
 \hline
 94537875 \\
 3 \\
 \hline
 283614625 \\
 1260505 \\
 \hline
 1544115 \text{ Ans}
 \end{array}$$

Simple Interest

5. what sum will discharge a bond given for 630 dollars 50cts on which there is 5 years interest at 8 percent per annum:

Ans. 882 dollars 40cts

$$\begin{array}{r} \text{Pc} \\ 630.50 \\ \underline{504400} \\ 2522000 \\ 63050 \\ \hline 882400 \end{array}$$

case 3

1. what is the interest of 650 dollars for 8 months at 6 percent per annum: Ans 26 dollars

$$\begin{array}{r} \text{D} \\ 650 \\ \text{half the months} \\ \hline \text{cents } 2600 \end{array}$$

2 what is the interest of 860 dollars for 1 year and 6 months at 6 percent per annum:

$$\begin{array}{r} 860 \\ \text{half the months} \\ \hline 4410 \text{ Ans } 44 \text{ dolls } 10 \text{ cts} \end{array}$$

3. what is the interest of 420 dolls for 9 months at 8 percent per annum:

$$\begin{array}{r} \text{D} \\ 420 \\ 9 \text{ months} \\ 8 \text{ percent} \\ \hline 2520 \text{ Ans } 25 \text{ dolls } 20 \text{ cts} \end{array}$$

the rate for the time

4 What is the amount of a note for 424 dollars with 18 months interest due thereon at 4 percent per annum: Ans. 464 dollars 44 cents.

$$\begin{array}{r} 18 \\ 4 \\ \hline 12 \overline{) 424} \\ 6 \\ \hline 4344 \\ 42400 \\ \hline 46444 \text{ Ans} \end{array}$$

5. What is the interest of 240 dollars for 15 months at 4 1/2 percent per annum: Ans. 22 dolls 50 cents.

$$\begin{array}{r} 15 \text{ months} \\ 4.5 \\ \hline 45 \\ 105 \\ 12 \overline{) 112.5} \\ 9375 \\ 240 \\ \hline 345000 \\ 18450 \\ \hline 2250000 \text{ Ans} \end{array}$$

6. What is the interest of 1260 dollars for 4 months at 6 1/2 percent per annum: Ans. 24 dolls 30 cts.

$$\begin{array}{r} 1260 \\ 6.5 \\ \hline 2166 \\ 4560 \\ 4560 \\ 1260 \\ \hline 2620 \\ 2429.160 \text{ Ans} \end{array}$$

[Decorative flourish]

Simple Interest

Case 1.

5. What is the interest of 12000 dollars for 40 days at 4 percent per annum: Ans. 32.5

12000 40
521 1180 000 42.6 nearly
469 26
10 4 110
10 11 28
3 1200

6. What is the interest of 8400 dollars for 20 days at 5 percent per annum: Ans. 23 dolls.

8400 20
7300 16800 0 23+
14600
22000
21900
100

7. 514.90 for 84 at 6 percent per annum 10. 1200.00 80 Ans. 15.78.1

514.90 84
204160
414320
6083 4350360 4.15.1
42581
9226
6083
31430
30415
10150
6083
4064

8. 73.11 24 days Ans 33

73.11 24
51287
14682
6083 198207 32.5 Ans
182119
15414
12166
35510
30415
5495

9. 225.24 40 days Ans 118.1

225.24 40
6083 900960 118.1 Ans
6083
29266
24332
49340
48664
6460
6083
644

10. 1200.00 80 days Ans 15.78.1

1200.00 80
6083 9600000 15.78.1 Ans
6083
351700
30415
44550
42581
49690
48664
10260
6083
4144

Simple Interest

11. $\begin{matrix} P & C & \text{days} \\ 2962.19 & 254 & \end{matrix}$ $\begin{matrix} P & C & m \\ \text{Ans. } 123.68.8 \end{matrix}$

$\begin{matrix} P & C \\ 2962.19 & 254 \\ \hline 1184876 \\ 1481095 \\ 592438 \\ \hline 123688 \end{matrix}$ $\begin{matrix} P & C & m \\ \text{Ans. } 123.68.8 \end{matrix}$

$\begin{matrix} 14409 \\ 12166 \\ \hline 22436 \\ 182119 \\ \hline 41842 \\ 36498 \\ \hline 53446 \\ 48664 \\ \hline 50820 \\ 48664 \\ \hline 2156 \end{matrix}$

2. What principal being put to interest for 12 years at 6 percent per annum will amount to 2452 dollars. $\text{Ans. } 1600 \text{ dolls.}$

$\begin{matrix} \text{year} \\ 12 \\ 6 \\ \hline 72 \end{matrix}$ $\begin{matrix} P & P \\ 100 & 2452 \\ \hline 172:100::2452 \end{matrix}$ $\begin{matrix} \text{Ans} \\ 100 \\ 142 \overline{) 245200} \\ 142 \\ \hline 1032 \\ 1032 \\ \hline 00 \end{matrix}$

12. $\begin{matrix} P & C & \text{days} \\ 1433.94 & 102 & \end{matrix}$ $\begin{matrix} P & C & m \\ \text{Ans. } 294.5 \end{matrix}$

$\begin{matrix} P & C \\ 1433.94 & 102 \\ \hline 346494 \\ 00000 \\ \hline 143394 \end{matrix}$ $\begin{matrix} \text{Ans} \\ 6083 \overline{) 1468649} \\ 12166 \\ \hline 85204 \\ 54744 \\ \hline 45794 \\ 42581 \\ \hline 32130 \\ 30415 \\ \hline 1715 \end{matrix}$

3. Received 428 dollars as payment in full for a note with 5 years interest thereon at 6 percent per annum. for how much was the note given. $\text{Ans. } 560 \text{ dollars.}$

$\begin{matrix} \text{years} \\ 5 \\ 6 \\ \hline 30 \end{matrix}$ $\begin{matrix} P & P \\ 100 & 428 \\ \hline 130:100::428 \end{matrix}$ $\begin{matrix} \text{Ans} \\ 100 \\ 130 \overline{) 42800} \\ 650 \\ \hline 480 \\ 480 \\ \hline 0 \end{matrix}$

||| case 5. |||

||| Case 6. |||

LF

Simple Interest

2. Paid 858 dollars in full for a note given for 650 dollars with 4 years interest due thereon: what was the rate percent. per annum charged on said note:

Ans. 8 percent.

$$\begin{array}{r} 858 \\ 650 \\ \hline 208 \end{array} \text{ Ans } 650 : 208 :: 100 : 32$$

$$\begin{array}{r} 100 \\ 650 \overline{) 20800} 32 \\ \underline{1950} \\ 1300 \end{array} \text{ 4 } 32 \text{ 8 Ans}$$

3. At what rate percent. will 1600 dollars amount to 2452 dollars in 12 years: Ans. 6 percent.

$$\begin{array}{r} 2452 \\ 1600 \\ \hline 1152 \end{array} \text{ Ans } 1600 : 1152 :: 100 : 72$$

$$\begin{array}{r} 100 \\ 1600 \overline{) 115200} 72 \\ \underline{11200} \\ 3200 \end{array} \text{ 12 } 72 \text{ 6 Ans}$$

Case 7.

2. In what time will 650 dollars amount to 910 dollars at 8 percent. per annum: Ans. 5 years

$$\begin{array}{r} 650 \\ 5200 \text{ Ans } 52 : 1 :: 260 \\ 910 \text{ amount} \\ 650 \text{ principal} \\ \hline 260 \end{array} \text{ 52 } 260 \text{ 5 Ans}$$

3. In what time will 1600 dollars amount to 2080 dollars at 6 percent. per annum. Ans. 5 years.

$$\begin{array}{r} 1600 \\ 9600 \text{ Ans } 96 : 1 :: 480 \\ 2080 \\ 1600 \\ \hline 480 \end{array} \text{ 96 } 480 \text{ 5 Ans}$$

Case 8.

Simple Interest Accm

1. A has B's note for 1000 dollars. dated 1st January 1816, payable in 18 months with interest from the date. At 6 percent per annum. On which the following payments are endorsed. viz.

$$\begin{array}{r}
 1000 \\
 30,00 \\
 \hline
 1000 \\
 1030 \\
 230 \\
 \hline
 800 \text{ sec P} \\
 24,00 \\
 800 \\
 \hline
 824,00 \\
 300 \\
 \hline
 524 \text{ third P} \\
 1/2 \\
 \hline
 524 \\
 262 \\
 \hline
 786 \\
 524 \text{ forth} \\
 531,86 \\
 254 \\
 \hline
 277,86 \\
 1/2 \\
 \hline
 277,86 \\
 12893 \\
 \hline
 4,16.79 \\
 277,86 \\
 \hline
 282,02,79
 \end{array}$$

1. A bond was given by B to C. for 2400 dollars, payable in 2 years with interest from the date. Dated July 1, 1815. On this bond the following payments are endorsed, viz. May 1, 1816, 900 dollars: Oct. 1, 1816, 450 dollars: Jan 1, 1817, 620 dollars. Required the amount due on the 1st of May 1817.

1815. July 1. principal 2400 dollars.

1816. May 1. 2400 multiplied by 304 429600

paid 900

Oct. 1. 1500

paid 450

153

229500

1816. Jan 1. 1050

Paid 620

92

96600

May 1. 430

interest 18455

120

5160.0

Divide by 60 1107300

Balance 614,55 Ans 184,55 interest

$ \begin{array}{r} 2400 \\ 900 \\ \hline 1500 \\ 450 \\ \hline 1050 \\ 620 \\ \hline 1430 \end{array} $	$ \begin{array}{r} 1050 \\ 620 \\ \hline 430 \\ 120 \\ \hline 8600 \\ 430 \\ \hline 51600 \\ 229500 \\ \hline 729600 \\ 96600 \\ \hline 6.0 \overline{) 110730.0} \\ 184,55 \text{ interest} \\ 430 \\ \hline 614,55 \text{ Ans} \end{array} $	$ \begin{array}{r} 1500 \\ 450 \\ \hline 1050 \\ 92 \\ \hline 2100 \\ 9450 \\ \hline 229500 \end{array} $	$ \begin{array}{r} 1500 \\ 153 \\ \hline 4500 \\ 4500 \\ \hline 1500 \\ 229500 \end{array} $	$ \begin{array}{r} 2400 \\ 304 \\ \hline 9600 \\ 0000 \\ \hline 4200 \\ 7296,00 \end{array} $
--	---	--	---	--

Ballance 614,55 Ans

Compound Interest James

3. What is the amount of 1500 dollars for 5 years, at 5 percent. per annum. Ans 1914 dolls. 12 cts.

$$\begin{array}{r}
 124628 \\
 1500 \\
 \hline
 63814000 \\
 124628 \\
 \hline
 1914,12.000 \text{ Ans}
 \end{array}$$

$$\begin{array}{r}
 3.20713 \\
 650 \\
 \hline
 16035650 \\
 1924278 \\
 \hline
 2084,63.450 \text{ Ans}
 \end{array}$$

4. What is the compound interest of 1500 dollars for 16 years. at 6 percent. per annum: Ans. 6931 dolls. 57 cts. 5 m.

$$\begin{array}{r}
 254035 \\
 1500 \\
 \hline
 124014500 \\
 1016140 \\
 \hline
 1143157.500 \\
 1500 \\
 \hline
 6931,57.500 \text{ Ans}
 \end{array}$$

6. A father left a legacy of 8000 dollars at compound interest, 6 percent. per annum. to be equally divided among his three sons. when the youngest. who was 11 years old. should arrive at the age of 21; what will be each one's share. Ans. 4180 dolls. 12 cts. each share

$$\begin{array}{r}
 2.69277 \\
 8000 \\
 \hline
 3 \overline{) 2154216000} \\
 7180,72 \text{ Ans}
 \end{array}$$

5. A has B's note for 650 dollars, payable at the end of 20 years. at 6 percent. per annum. compound interest; what sum will it require to discharge the note. at the expiration of the given time?

Ans. 2084 dolls. 63 cts. 4 m.

Insurance Commission ^{and Brokage}

Section II

1. What is the premium of insuring 1260 dollars at 5 percent:

$$\begin{array}{r} 1260 \\ 5 \\ \hline 63.00 \end{array} \text{Ans } 63 \text{ dollars}$$

2. 1650 dollars at 15½ percent.

$$\begin{array}{r} 1650 \\ 15\frac{1}{2} \\ \hline 8250 \\ 1650 \\ 825 \\ \hline 25575 \end{array} \text{Ans}$$

3. 4500 dolls 25 Ans 1125 00

$$\begin{array}{r} 4500 \\ 25 \\ \hline 22500 \\ 9000 \\ \hline 112500 \end{array} \text{Ans}$$

4. What sum must a policy be taken out for to cover 900 dollars when the premium is 10 per cent:

$$\begin{array}{r} 198 \\ 90 \\ \hline 90 : 100 : 900 \end{array} \begin{array}{r} 100 \\ 90 \\ \hline 900000 \\ 90 \\ \hline 000 \end{array} \text{Ans } 1000$$

5. What sum will it require to cover a policy of insurance for 4500 dollars at 25 percent: Ans 6000 dollars.

$$\begin{array}{r} 100 \\ 25 \\ \hline 75 \\ 45 : 100 : : 4500 \end{array} \begin{array}{r} 100 \\ 45 \\ \hline 450000 \\ 450 \\ \hline 000 \end{array} \text{Ans } 6000$$

6. What sum will it require to cover a policy of insurance for 560 dolls. at 9 per cent: Ans. 615 dollars. 38½¢

$$\begin{array}{r} 100 \\ 9 \\ \hline 91 \\ 91 : 100 : : 560 \end{array} \begin{array}{r} 100 \\ 560000 \\ 546 \\ \hline 140 \\ 91 \\ \hline 490 \\ 455 \\ \hline 350 \\ 223 \\ \hline 440 \\ 428 \\ \hline 126 \\ 91 \\ \hline 13 \end{array}$$

James McCormick

[Signature]

And Brokage And Brokage Insurance Commission

Commission. \$\$\$

2 What is the commission on 1260 dollars at 6 percent:

Ans. 75 dolls. 60 cts.

$$\begin{array}{r} 1260 \\ 6 \\ \hline 7560 \text{ Ans} \end{array}$$

3. 2550 dolls at 4 percent. Ans. 102 00

$$\begin{array}{r} 2550 \\ 4 \\ \hline 10200 \text{ Ans} \end{array}$$

4. 263 1/2 dolls 3 percent Ans 790,26

$$\begin{array}{r} 263 \frac{1}{2} \\ 3 \\ \hline 790,26 \text{ Ans} \end{array}$$

5. 6422 6/11 Ans 118,16 1/2

$$\begin{array}{r} 6422 \frac{6}{11} \\ 11 \\ \hline 6422 \frac{6}{11} \\ 11 \\ \hline 32110 \\ 114954 \\ \hline 118,16,50 \text{ Ans} \end{array}$$

6. A commission merchant receives 1260 dollars to fill an order, from which he is instructed to deduct his own commission of 5 percent. how much will remain to satisfy the order:

1200 dolls. Ans

$$\begin{array}{r} 100 \\ 5 \\ \hline 105 : 100 :: 1260 \end{array}$$

$$\begin{array}{r} 100 \\ 105 \overline{) 126000} \\ \underline{105} \\ 210 \\ 210 \\ \hline 00 \end{array}$$

7. A commission merchant has received 1120 dollars with instruction to vest it in salt at 8 dolls per barrel: deducting from it his commission of 3 percent. how many barrels of salt can he purchase:

Ans. 500 barrels.

$$\begin{array}{r} 100 \\ 3 \\ \hline 103 : 100 :: 1120 \end{array}$$

$$\begin{array}{r} 100 \\ 103 \overline{) 112000} \\ \underline{103} \\ 000 \end{array}$$

$$\begin{array}{r} 10000 \\ 500 \text{ Ans} \end{array}$$

Insurance Commission And Brokerage

Brokerage. III

2. What is the brokerage on 1625 dollars 50 cents, at $3\frac{1}{3}$ percent:
Ans. 54 dolls. 18 cts.

$$\begin{array}{r}
 1625,50 \\
 \times 3\frac{1}{3} \\
 \hline
 487650 \\
 54183.3 \\
 \hline
 54,18.33 \text{ Ans}
 \end{array}$$

3. 1868 dollars at $2\frac{1}{2}$ percent.
Ans. 46 dolls. 40 cts.

$$\begin{array}{r}
 1868 \\
 \times 2\frac{1}{2} \\
 \hline
 3436 \\
 934 \\
 \hline
 46,40 \text{ Ans}
 \end{array}$$

4. 560 at 6 33 dolls 60 cts

$$\begin{array}{r}
 560 \\
 \times 6 \\
 \hline
 33,60 \text{ Ans}
 \end{array}$$

[Decorative flourish]
[Signature]

Buying And Selling Stocks

Section 5.

1. What is the amount of 1650 dolls.
United States bank stock, at 125
per cent. or 25 per cent. above par.

$$\begin{array}{r}
 1650 \\
 125 \\
 \hline
 8250 \\
 3300 \\
 1650 \\
 \hline
 10000 \\
 2062.50 \text{ Ans. } 2062 \text{ dolls. } 50 \text{ cts.} \\
 \text{Or thus. } 25 \text{ is } \frac{1}{4} \text{ of } 1650 \\
 412.50 \\
 2062.50 \text{ Ans}
 \end{array}$$

2. 1500 bank stock at 110 per cent.

$$\begin{array}{r}
 1500 \\
 110 \\
 \hline
 15000 \\
 1500 \\
 \hline
 16500 \text{ Ans}
 \end{array}$$

3. 1686 at 128 Ans 2158,08

$$\begin{array}{r}
 1686 \\
 128 \\
 \hline
 13488 \\
 3372 \\
 1686 \\
 \hline
 2158,08 \text{ Ans}
 \end{array}$$

4. 25000 at 108 Ans 27000,00

$$\begin{array}{r}
 25000 \\
 108 \\
 \hline
 2000000 \\
 250000 \\
 \hline
 270000,00 \text{ Ans}
 \end{array}$$

5. 1260 at 90 Ans 1134,00

$$\begin{array}{r}
 1260 \\
 90 \\
 \hline
 1134,00 \text{ Ans}
 \end{array}$$

6. 925 at 84 Ans 777,36

$$\begin{array}{r}
 925 \\
 84 \\
 \hline
 37016 \\
 44032 \\
 \hline
 7773,36 \text{ Ans}
 \end{array}$$

7. 1518 at 83 $\frac{1}{2}$ Ans 1271,32 $\frac{1}{2}$

$$\begin{array}{r}
 1518 \\
 83.75 \\
 \hline
 7590 \\
 10626 \\
 4554 \\
 12144 \\
 \hline
 1271,32.50 \text{ Ans}
 \end{array}$$

Relate or Discount

Section 6.

2. what is the present worth of 2464 dollars due 1 year and 6 months hence, discounting at the rate of 8 per cent. per annum.

Ans 2200 dollars.

$$\begin{array}{r}
 100 \text{ } 9 \text{ } 9 \\
 112 : 100 :: 2464 \\
 \hline
 112 \overline{) 246400} \quad 2200 \\
 \underline{224} \\
 224 \\
 \underline{224} \\
 00
 \end{array}$$

3. Ahas B's note for 1854 dollars 50 cents payable 8 months after date:

what is the present worth of said note discounting at the rate of 6 1/2 percent per annum: Ans. 1791 dolls. 80 cts.

$$\begin{array}{r}
 M \text{ } 9 \text{ } M \text{ } 9 \\
 12 : 5.8 :: 8 \\
 \hline
 12 \overline{) 1140} \quad 366 \\
 \underline{36} \\
 80 \\
 \underline{72} \\
 80 \\
 \underline{72} \\
 8
 \end{array}$$

$$\begin{array}{r}
 103,66 : 100 :: 1854,50 \\
 \hline
 103,66 \overline{) 185450} \quad 1791,15 \\
 \underline{10366} \\
 82091 \\
 \underline{72562} \\
 95280 \\
 \underline{93294} \\
 19860 \\
 \underline{10366} \\
 94940 \\
 \underline{93294} \\
 16460 \\
 \underline{10366} \\
 60940 \\
 \underline{51830} \\
 9110
 \end{array}$$

4. What reduction must be made for prompt payment of a note for 650 dollars due 2 years hence, 7 per cent. per annum. being allowed for discount:

Ans. 49 dollars. 83 + cts.

$$\begin{array}{r}
 D \text{ years} \\
 1 : 7 :: 2 \\
 \hline
 14 \\
 100 \\
 114 : 100 :: 650 \\
 \hline
 114 \overline{) 65000} \quad 570,17 \\
 \underline{570} \\
 800 \\
 \underline{798} \\
 200 \\
 \underline{114} \\
 860 \\
 \underline{798} \\
 62
 \end{array}$$

5. what is the present worth of 5150 dollars due in 1 1/2 months discounting at the rate of 8 percent. per annum. and allowing 1 percent. for prompt payment:

Ans. 4950 dollars

$$\begin{array}{r}
 M \text{ } 9 \text{ } M \\
 12 : 8 :: 1.5 \\
 \hline
 12 \overline{) 360} \\
 \underline{360} \\
 0
 \end{array}$$

$$\begin{array}{r}
 3 \text{ percent} \\
 1.00 \\
 103 : 100 :: 5098,50 \\
 \hline
 10300 \overline{) 50985000} \quad 4950 \\
 \underline{41200} \\
 97850 \\
 \underline{92400} \\
 51500 \\
 \underline{51500} \\
 0
 \end{array}$$

Rate or Discount

1. what is the discount of 1272 dollars due in 12 months discounting at 6 per cent. per annum.

$$As\ 106 : 100 :: 1272 : 1200$$

Discount 72

1. what much is the discount of 260 dollars at 5 per cent

$$\frac{260}{5} = 1300\ \text{Ans. 130 dollars}$$

2. What is the interest of the same sum, for the same time and rate:

$$\begin{array}{r} 1272 \\ 6 \\ \hline 211.6 \end{array}$$

interest. P. C. 76.32
72
4.32

2. what is the discount on 1650 dollars at 3 per cent.

Ans. 49 dollars. 50 cts.

$$\begin{array}{r} 1650 \\ 3 \\ \hline 550 \end{array}$$

Ans

3. What is the difference between the interest and discount 7280 dollars for 18 months, at 8 per cent. per annum: Ans. 93 dolls. 60 cts. difference

$$12 : 8 :: 18$$

$$\begin{array}{r} 12 \overline{) 144} \\ 12 \\ \hline 24 \\ 24 \\ \hline 0 \end{array}$$

$$112 : 100 :: 7280$$

$$\begin{array}{r} 7280 \\ 6500 \\ \hline 780 \end{array}$$

$$\begin{array}{r} 112 \overline{) 72800} \\ 672 \\ \hline 560 \\ 560 \\ \hline 00 \end{array}$$

$$\begin{array}{r} 7280 \\ 58240 \\ 29120 \\ \hline 84360 \\ 780 \\ \hline 9360\ \text{Ans} \end{array}$$

3. what sum will discharge a bond for 2464 dollars on which a discount of 8 per cent. is given: Ans. 2266 dollars. 88 cents.

$$\begin{array}{r} 2464 \\ 8 \\ \hline 19712 \end{array}$$

$$19712$$

$$\begin{array}{r} 246400 \\ 19712 \\ \hline 226688 \end{array}$$

Handwritten signature and decorative flourishes.

Large handwritten flourish or signature.

Bank Discount James

III Section 7. III

2. What is the discount of 250 dollars for 30 days:

Ans. 1 dollar 11 $\frac{2}{3}$ cts

$$\begin{array}{r} 250 \\ 30 \\ \hline 1000 \\ 750 \\ \hline 60 \overline{) 8500} \\ 1116 \frac{2}{3} \end{array} \text{ Ans}$$

3. What is the discount of 600 dollars for 90 days:

Ans. 9 dolls. 11 cts.

$$\begin{array}{r} 600 \\ 90 \\ \hline 2400 \\ 5400 \\ \hline 60 \overline{) 56400} \\ 940 \end{array} \text{ Ans}$$

4. what is the discount of 1260 dollars 40 cents for 60 days:

Ans. 13 dollars 11 cts.

$$\begin{array}{r} 1260 \text{ 40} \\ 60 \\ \hline 504160 \\ 756240 \\ \hline 60 \overline{) 8066560} \\ 134442+ \end{array} \text{ Ans}$$

5. What is the discount of 2649 dollars 75 cents for 60 days:

Ans. 28 dolls. 26 cents 11 m.

$$\begin{array}{r} 2649 \text{ 75} \\ 60 \\ \hline 1054900 \\ 1589850 \\ \hline 60 \overline{) 16958400} \\ 282640 \end{array} \text{ Ans}$$

Equation of Payments

Section 8.

1. A owes B 600 dollars of which 200 is to be paid in 4 months, 200 at 8 months, and 200 at 12 months: but they agree to make but one payment: when must that payment be made?

$$\begin{array}{r} 200 \times 4 = 800 \\ 200 \times 8 = 1600 \\ 200 \times 12 = 2400 \\ \hline 600 \overline{) 4800} \end{array} \begin{array}{l} 8 \text{ months} \\ \text{Ans} \end{array}$$

2. A merchant has owing to him from his friend the sum of 3000 dollars to be paid as follows: viz. 500 dollars at 2 months, 1000 dollars at 5 months, and the rest at 8 months: but they agree to make one payment of the whole: what will be the mean time of payment? Ans. 6 months.

$$\begin{array}{r} 500 \times 2 = 1000 \\ 1000 \times 5 = 5000 \\ 1500 \times 8 = 12000 \\ \hline 3000 \overline{) 18000} \end{array} \begin{array}{l} 6 \text{ months} \\ \text{Ans} \end{array}$$

3. A buys of B 50 acres of land for which he agrees to pay 1000 dollars at the following times viz. 200 dollars at 5 months, 300 dollars at 8 months, and the rest at 10 months: but an equation of payments is afterwards agreed upon: when the payment be made?

Ans. 8 months 12 days.

$$\begin{array}{r} 200 \times 5 = 1000 \\ 300 \times 8 = 2400 \\ 500 \times 10 = 5000 \\ \hline 1000 \overline{) 8400} \end{array} \begin{array}{l} 8 \text{ months} \\ 12 \text{ days} \\ \text{Ans} \end{array}$$

4. C owes D 1400 dollars to be paid in 3 months: but D being in want of money C pays him 1000 dollars at the expiration of 2 months: how much longer than 3 months may he in Justice defer the payment of the rest? Ans. 2 1/2 months.

$$\begin{array}{r} 1000 : 1 :: 400 \\ 400 \overline{) 1000} \end{array} \begin{array}{l} 2 \text{ months} \\ 25 \text{ days} \\ \text{Ans} \end{array}$$

$$\begin{array}{r} 1400 \times 3 = 4200 \\ 1000 \times 1 = 1000 \\ \hline 2200 \overline{) 4200} \end{array} \begin{array}{l} 1.9 \text{ months} \\ 25 \text{ days} \\ \text{Ans} \end{array}$$

Fellowship

James McEwen

Section 9.

1. Two merchants join their stock in Trade: A puts in 600 dollars, and B puts in 400 dolls. and they gain 250 dollars; what part belongs to each:

A 600
B 400
1000
1000:250::600 to A 150
1000:250::400 to B 100
250

18000:5400::4500
4500
2700000
21600
24300000(1350 Ans
18000
63000
54000
90000
90000

Ans { A 2250 dollars
B 1800
C 1350
5400 Profit

2. Three merchants enter into partnership in trade; A advanced 4500 dollars. B 6000, and C 4500, with this they gained 5400 dollars: what was each partner's share:

A 4500
B 6000
C 4500
7500
6000
4500

18000:5400::4500
4500
2700000
37800
18000/40500000(2250 Ans
36000
45000
36000
90000
90000

18000:5400::6000
6000
18000/32400000(1800 Ans
18000
144000
144000
00

3. A bankrupt is indebted to A 1291 dollars 23 cents, to B 500 dollars 34 cents, to C 89 dollars 40 cents. To D 228 dollars; and his estate is worth but 2046 dollars 45 cents: how much does he pay per cent. and how much is each creditor to receive:

1291.23
500.37
89.40
228
2729.00:2046.45::1291.23
2729.00
6140.25
4093.50
2046.45
18420.75
4093.50
2246.75

26428250025(968,424 Ans
245610.0
1864280
1624400
2298500
2183200
1153002
1091600
614025
545800
68225
2729000(4
2729000

Single Fellowship

$$242900:204645::50037$$

$$\begin{array}{r} 50037 \\ 1432728 \\ 614025 \\ 22500 \\ 102334800 \end{array}$$

$$10241322945(375,27\frac{3}{4}) \text{ Ans}$$

$$818700$$

$$2054322$$

$$1910300$$

$$1440229$$

$$1364500$$

$$454295$$

$$545800$$

$$2114950$$

$$1910300$$

$$204650$$

$$818700(3\frac{3}{4})$$

$$818700$$

$$242900:204645::70940$$

$$70940$$

$$8187000$$

$$1842075$$

$$14327250$$

$$14519644500(53205) \text{ Ans}$$

$$1364500$$

$$874644$$

$$818700$$

$$559445$$

$$545800$$

$$1364500$$

$$1364500$$

$$242900:204645::228$$

$$228$$

$$1634400$$

$$409350$$

$$409350$$

$$46665900(141) \text{ Ans}$$

$$242900$$

$$1934590$$

$$1910300$$

$$242900$$

$$242900$$

75 percent. { A receives 968424
Ans. he pays { B 375272
C 53205
D 141

$$242900:204645::100$$

$$100$$

$$\begin{array}{r} 20464500 \\ 1910300 \\ 1364500 \\ 1364500 \end{array} \text{ 75 percent}$$

11. three men. A. B. and C. rent a farm containing 585 acres 2 roods and 31 perches. at 600 dollars per year; of which A pays 180 dolls. B 195, and C 225. and they agree that the farm shall be divided in proportion to the rents; how many acres must each man have:

a	r	p
180	585	2 31
195	4	
225	2342	
600	40	

$$: 93714 : : 180$$

$$\begin{array}{r} 7497120 \\ 93714 \\ 600 \end{array}$$

$$600 \overline{) 16868520} (28114$$

$$\begin{array}{r} 1200 \\ 4868 \\ 4800 \end{array}$$

$$\begin{array}{r} 685 \\ 600 \end{array}$$

$$\begin{array}{r} 852 \\ 600 \end{array}$$

$$\begin{array}{r} 2520 \\ 2400 \end{array}$$

$$12 \overline{) 120} = 1$$

$$60 \overline{) 600} = 5$$

Single Fellowship

James McComick

$$600 : 93714 :: 195$$

$$\begin{array}{r} 468570 \\ 843426 \\ 93714 \\ \hline 600 \overline{) 18274230} \quad (30457 \\ 1800 \\ \hline 2742 \\ 2400 \\ \hline 3423 \\ 3000 \\ \hline 4230 \\ 4200 \\ \hline 3 \overline{) 30} = 1 \\ 60 \overline{) 0} = 20 \end{array}$$

$$600 : 93714 :: 225$$

$$\begin{array}{r} 468570 \\ 187428 \\ 187428 \\ \hline 600 \overline{) 21085650} \quad (35142 \\ 1800 \\ \hline 3085 \\ 3000 \\ \hline 856 \\ 600 \\ \hline 2565 \\ 2400 \\ \hline 1650 \\ 1200 \\ \hline 15 \overline{) 450} = 3 \\ 60 \overline{) 0} = 11 \end{array}$$

	A	B	C
Ans. A's share is	195	2	34 $\frac{1}{2}$
B's	190	1	17 $\frac{1}{2}$
C's	219	2	22 $\frac{3}{4}$

5. Three merchants freighted a ship with 2160 barrels of flour of which 960 barrels belonged to A. 720 barrels to B. and 480 barrels to C; but on account of stormy weather they were obliged to throw 900 barrels overboard: how many barrels did each man lose?

$$\begin{array}{r} B \\ 960 \\ 720 \\ 480 \\ \hline 2160 : 960 :: 960 \\ 960 \\ \hline 54000 \\ 8100 \\ \hline 864000 \quad (400 \text{ Ans} \\ 8640 \\ \hline 00 \end{array}$$

$$2160 : 900 :: 720$$

$$\begin{array}{r} 720 \\ \hline 18000 \\ 6300 \\ \hline 2160 \overline{) 648000} \quad (300 \text{ Ans} \\ 6480 \\ \hline 00 \end{array}$$

$$2160 : 900 :: 480$$

$$\begin{array}{r} 480 \\ \hline 2160 \overline{) 43200} \quad (200 \text{ Ans} \\ 4320 \\ \hline 00 \end{array}$$

Ans. A lost 400 barrels
B 300
C 200

6. Three merchants gain stock in trade: A put in 1260 dollars, B 840 dollars, and C a certain sum, and they gained 825 dollars of which C took for his part 275 dollars; required A and B's part of the gain, and how much stock C put in:

Single Fellowship

$$\begin{array}{r}
 D \\
 1260 \\
 840 \\
 \hline
 2100
 \end{array}
 \begin{array}{l}
 825 \text{ whole gain} \\
 245 \text{ C's gain} \\
 : 550 : : 1260 \\
 \hline
 33000 \\
 1100 \\
 550 \\
 \hline
 2100 \overline{) 693000} \quad 550 \text{ A's B's G} \\
 \underline{6300} \quad 330 \text{ d's G} \\
 6300 \quad 220 \text{ B's G} \\
 \underline{6300} \\
 0
 \end{array}$$

$$220 : 840 : : 245$$

$$\begin{array}{r}
 245 \\
 4200 \\
 5880 \\
 \hline
 1680 \\
 231000 \overline{) 1050} \text{ C's stock} \\
 \underline{220} \\
 1100 \\
 \underline{1100}
 \end{array}$$

Ans. C gained 330 dolls.
C's stock was 1050

7. Four men traded with a stock of 800 dollars, and they gained in two years time twice as much, and no dollars over; A's stock was 140 dollars, B's 260. C's 300; required D's stock, and what each gained:

$$\begin{array}{r}
 D \\
 140 \\
 260 \\
 300 \\
 100 \\
 \hline
 800
 \end{array}
 \begin{array}{l}
 800 \\
 400 \\
 \hline
 100 \text{ D's stock}
 \end{array}$$

$$800 : 1640 : : 140$$

$$\begin{array}{r}
 65600 \\
 640 \\
 \hline
 800 \overline{) 229600} \quad 287 \text{ A's share} \\
 \underline{1600} \\
 6960 \\
 \underline{6400} \\
 5600
 \end{array}$$

$$800 : 1640 : : 260$$

$$\begin{array}{r}
 260 \\
 98400 \\
 3280 \\
 \hline
 800 \overline{) 426400} \quad 533 \text{ B's share} \\
 \underline{4000} \\
 2640 \\
 \underline{2400} \\
 2400
 \end{array}$$

$$800 : 1640 : : 300$$

$$\begin{array}{r}
 300 \\
 800 \overline{) 492000} \quad 615 \text{ C's share} \\
 \underline{1800} \\
 1200 \\
 800 \\
 \hline
 4000 \\
 4000
 \end{array}$$

$$800 : 1640 : : 100$$

$$\begin{array}{r}
 100 \\
 800 \overline{) 164000} \quad 205 \text{ D's share} \\
 \underline{1600} \\
 4000 \\
 4000
 \end{array}$$

D's stock was 100 dollars
A's gain was 287
Ans. B's 533
C's 615
D's 205

Compound Fellowship

Examples SSS

What is each man's share:

1. Three merchants entered into trade; A put in 2500 dollars for 11 months. B 3000 dollars for 6 months, and C 1000 dollars for 8 months, and they gained 1200 dollars what is each man's share of the gain:

$$\begin{aligned} A & 2500 \times 11 = 10000 \\ B & 3000 \times 6 = 18000 \\ C & 1000 \times 8 = 8000 \end{aligned}$$

Sum 60000

$$\begin{aligned} 60000 : 1200 & :: 10000 : 200 \text{ shares} \\ & 18000 : 360 \text{ shares} \\ & 8000 : 160 \text{ shares} \end{aligned}$$

1200 proof

2. Three merchants enter into partnership for 16 months: A put into stock at first 600 dollars, and at the end of 8 months, 200 dollars more; B put in at first 1200 dollars, but at the end of 10 months, was obliged to take out 600 dollars; C put in at first 1000 dollars, and at the end of 12 months put in 800 more: with this stock they gained 2300 dollars:

$$\begin{aligned} 600 \times 16 &= 9600 + 1600 = 11200 \\ 200 \times 8 &= 1600 \\ 1200 \times 10 &= 12000 + 3600 = 15600 \\ 600 \times 6 &= 3600 \\ 1000 \times 16 &= 16000 + 3200 = 19200 \\ 800 \times 12 &= 9600 \end{aligned}$$

$$46000 : 2300 :: 11200$$

$$\begin{array}{r} 46000 \\ 2300 \overline{) 112000} \\ \underline{46000} \\ 23000 \\ \underline{46000} \\ 0 \end{array} \quad \text{Ans } 560$$

$$\begin{array}{r} 46000 : 2300 :: 15600 \\ 2300 \overline{) 156000} \\ \underline{46000} \\ 31200 \\ \underline{46000} \\ 35800 \\ \underline{46000} \\ 3680 \\ \underline{46000} \\ 3680 \\ \underline{46000} \\ 0 \end{array} \quad \text{Ans } 780$$

$$\begin{array}{r} 46000 : 2300 :: 19200 \\ 2300 \overline{) 192000} \\ \underline{46000} \\ 38400 \\ \underline{46000} \\ 41600 \\ \underline{46000} \\ 2960 \\ \underline{46000} \\ 2960 \\ \underline{46000} \\ 0 \end{array} \quad \text{Ans } 960$$

Ans. A's share is 560 dollars
B's 780
C's 960

[Decorative flourish]

Compound Fellowship

3. A and B Joine stock in trade
A put in 600 dollars on the first
of January. B advanced on
the first of April a sum
which entitled him to an equal
share of the profit at the end of
the year: required the sum B
put in Ans. 800 dollars

$$\begin{array}{r} M \quad D \quad M \\ 12 : 600 :: 9 \\ 12 \\ 9 \overline{) 7200} \quad (800 \text{ Ans} \\ \underline{72} \\ 00 \end{array}$$

11. D put in stock 1800 dollars: At
the end of 11 months agreed to adv
ance such a sum as at the end of
the year. will entitle him to an
equal share of the profits: what
sum must C advance:

$$\begin{array}{r} M \quad D \quad M \\ 12 : 1800 :: 8 \\ 12 \\ 8 \overline{) 21600} \quad (2700 \text{ Ans} \\ \underline{16} \\ 56 \\ \underline{56} \\ 00 \end{array}$$

5. two gentlemen A and B. hired a
carriage in pittsburgh to go to
philadelphia and return, for 160 dol
lars. with liberty to take in two
others by the way. when at philade
phia they took in C. and after wards
100 miles from pittsburgh they
took in D. Now allowing it to be
300 miles from pittsburgh to
philadelphia. and also that each man
pays in proportion to the distance
he rode: it is required to tell how
much each must pay:

$$\begin{array}{r} A \ 600 \\ B \ 600 \\ C \ 300 \\ D \ 100 \\ \hline 1600 : 160 :: 600 \\ 1600 \overline{) 96000} \quad (60 \ A \\ \underline{9600} \quad 0 \quad 60 \ B \\ \quad \quad \quad 30 \ C \\ \quad \quad \quad 10 \ D \\ \quad \quad \quad \hline 160 \text{ Proof} \\ 1600 : 160 :: 300 \\ \quad \quad \quad 300 \\ \quad \quad \quad \hline 48000 \quad (30 \ C \\ \underline{4800} \\ 0 \end{array}$$

$$\begin{array}{r} 1600 : 160 :: 100 \\ \quad \quad \quad 100 \\ \quad \quad \quad \hline 1600 \quad (10 \ D \\ \underline{1600} \\ 0 \end{array}$$

A pays 60 dollars

$$\begin{array}{r} 60 \\ 30 \\ 10 \\ \hline 160 \text{ proof.} \end{array}$$

Profit And Loss

§§ Section 10. §§§

2. Bought a piece of cloth for 1 dollar and 20 cents per yard, and sold it again for 1 dollar 50 cents a yard: what is the gain per cent.

Ans 25 per cent.

96
150
120

120 : 30 :: 100

30
120 3000 (25 Ans
240
600
600

3. Bought a piece of linen containing 12 yards for 21 dolls. and sold it at 66 cents per yard; what is the gain or loss on the whole piece:

Ans. 6 dolls. 42 cts gain.

Yards C Yards
1 : 66 :: 12

132
264
2772
21

6,72 Ans

4. A merchant bought 6 barrels of whiskey containing 32 gallons each for 96 dollars; while in his possession he lost 12 gallons by leakage. the residue he sold for such a sum as gained him 12 dollars. the residue he sold for such a sum as gained him 12 dolls on the whole. how much per gallon did he buy and sell for:

Ans bought for 50 cents. and sold for 60 cents per gallon.

Barrels
32
182 D B
192 : 96 :: 1

9600 (50 Ans
9600

192 96
12 12
180 : 108 :: 1

180 10800 (60 Ans
10800

5. Bought 120 dozen of knives for 20 cents each knife. and sold them again for 14 cents each. what was the loss on the whole: Ans. 13 dolls. 20 cts.

20
14
1 : 3 :: 1440
43,20 Ans

Profit And Loss

6. A merchant gave 119 dollars for 100 yards of cloth at how much per yard must he sell it to gain 51 dollars on the whole.

Ans. 2 dollars.

$$\begin{array}{r} \text{yards} \quad 7 \text{ yards} \\ 100 : 200 :: 1 \\ 100 \overline{) 200} \quad 2 \text{ Ans} \\ \underline{200} \end{array}$$

$$\begin{array}{r} C \\ 90 \\ 20 \\ 100 : 120 :: 90 \\ 100 \overline{) 10800} \quad 108 \text{ Ans} \\ \underline{100} \\ 800 \\ 800 \end{array}$$

$$\begin{array}{r} 108 \\ 90 \\ 1 : 18 :: 240 \\ 18 \\ 1920 \\ 240 \\ \hline 4320 \text{ Ans} \end{array}$$

7. Bought a chest of tea at 1 dollar and 25 cents per pound. but finding it to be of an inferior quality. I am willing to lose 18 percent. by it; how must I sell it per pound.

Ans. 1 doll. 2½ cts. per lb.

$$\begin{array}{r} 100 \\ 18 \\ 100 : 82 :: 125 \\ 82 \\ 250 \\ 1000 \\ 100 \overline{) 10250} \\ \underline{1000} \\ 10250 \text{ Ans} \end{array}$$

9. A trader bought a hog's head of rum of a certain proof. containing 115 gallons. at 1 dollar 10 cents per gallon; how many gallons of water must he put into it to gain 5 dollars. by selling it at 1 dollar per gallon.

Ans. 16½ gallons.

$$\begin{array}{r} C \\ 110 \\ 100 \\ 1 : 10 :: 115 \\ 10 \\ 1150 \\ 5 \\ 100 : 1 :: 1650 \\ 100 \overline{) 1650} \quad 16.5 \text{ Ans} \\ \underline{100} \\ 650 \\ 650 \\ \hline 300 \end{array}$$

8. A merchant bought 20 dozen of wool hats at 90 cents per hat. at what rate must he sell them again to gain 20 per cent. and how much does he gain on the whole.

Ans. he must sell at 1 doll. 8 cts per hat. and gains 12 dolls 20 cts

SS

Profit And Loss

10. A merchant bought 11 hundred weight of coffee for 134 dollars and 10 cents, and was afterwards obliged to sell it at 25 cents per pound: what was his loss on the whole and how much on each pound: Ans. 5 cents loss on each pound, and 22 dollars. 10 cts. on the whole.

$$\begin{array}{r} \text{ll} \quad \text{D} \quad \text{C} \quad \text{ll} \\ 11 \text{ Hrs. } 134.10 : : 1 \\ 134 \text{ H } 30 \\ \hline 0.25 \\ \hline 5 \text{ Ans} \end{array}$$

$$\begin{array}{r} \text{ll} \\ 1 : 5 : : 11 \text{ Hrs. } 5 \\ \hline 22.40 \text{ Ans} \end{array}$$

11. If by selling 360 yards of broad cloth for 1428 dollars. There is gained 20 per cent. profit. what did it cost per yard: Ans. 4 dollars.

$$\begin{array}{r} \text{D} \quad \text{D} \quad \text{D} \\ 120 : 100 : : 1428 \\ \hline 120 \overline{) 14280} \quad 11 \text{ Hrs. } 10 \text{ first cost} \\ \underline{120} \\ 228 \\ \underline{120} \\ 108 \\ \underline{120} \\ 88 \\ \underline{120} \\ 68 \\ \underline{120} \\ 48 \\ \underline{120} \\ 28 \\ \underline{120} \\ 8 \end{array}$$

$$\begin{array}{r} \text{yards} \quad \text{D} \\ 360 : 11 \text{ Hrs. } 10 : : 1 \\ \hline 11 \text{ Hrs. } 10 \text{ Ans} \end{array}$$

12. A merchant laid out 1000 dollars on cloth, at 11 dollars per yard, and sold it again at 11 dollars 90 cents per yard, what was his whole gain: Ans. 225 dollars.

$$\begin{array}{r} \text{D} \quad \text{yard} \quad \text{D} \\ 11 : 1 : : 1000 \\ \hline 250 \\ \text{yard} \quad \text{C} \\ 1 : 90 : : 250 \\ \hline 90 \\ \hline 225.00 \text{ Ans} \end{array}$$

13. A sells a quantity of wheat 1 dollar per bushel, and gains 20 per cent; shortly after he sold of the same to the amount of 34 dollars 50 cents, and gained 50 per cent; how many bushels were there in the last parcel, and at what rate did he sell it per bushel: Ans. 30 bushels, at 1 dollar 25 cts. per bushel.

$$\begin{array}{r} \text{C} \quad \text{C} \quad \text{C} \\ 120 : 100 : : 100.00 \\ \hline 120 \overline{) 10000} \\ \underline{120} \\ 800 \\ \underline{120} \\ 680 \\ \underline{120} \\ 560 \\ \underline{120} \\ 440 \\ \underline{120} \\ 320 \\ \underline{120} \\ 200 \\ \underline{120} \\ 80 \end{array}$$

$$\begin{array}{r} 100 : 150 : : 83\frac{1}{3} \text{ first cost} \\ \hline 83\frac{1}{3} \\ \underline{120} \\ 450 \\ \underline{120} \\ 330 \\ \underline{100} \\ 250 \text{ sold for} \end{array}$$

$$\begin{array}{r} \text{D} \quad \text{Bu} \quad \text{D} \\ 1.25 : 1 : : 3750 \\ \hline 3750 \text{ 30 bushels sold} \end{array}$$

P

Profit and Loss

14. A trader is about purchasing 5000 galls. of whiskey, which he can have at 48 cents per gallon in ready money, or 50 cents with 2 months credit; which will be the most profitable, either to buy it on credit, or by borrowing the money at 8 per cent. per annum, to pay the cash price: Ans. He will gain 68 dolls. by paying the cash.

$$\begin{array}{r} \text{G} \quad \text{C} \quad \text{G} \\ 1 : 48 :: 5000 \\ \underline{5000} \\ 240000 \\ \underline{3200} \\ 2432 \end{array}$$

$$\begin{array}{r} \text{G} \quad \text{C} \quad \text{G} \\ 1 : 50 :: 5000 \\ \underline{50} \\ 250000 \\ \underline{2432} \\ 68 \text{ Ans} \end{array}$$

$$\begin{array}{r} \text{M} \quad \text{D} \quad \text{M} \\ 12 : 8 :: 2 \\ \underline{2} \\ 12 \overline{) 16} \\ \underline{12} \\ 4 \end{array}$$

$$\begin{array}{r} \text{P} \quad \text{P} \quad \text{P} \\ 100 : 1\frac{1}{3} :: 2400 \\ \underline{1\frac{1}{3}} \\ 2400 \\ \underline{800} \\ 100 \overline{) 3200} \end{array}$$

15. A butcher bought 12 head of beef cattle of equal weight, for 240 dollars, which he sells again for 11 cents per pound; what ought each one to weigh, that the butcher may have the hide and tallow as clear gain: Ans. weat. 197. 2 lbs.

$$\begin{array}{r} \text{C} \quad \text{L} \quad \text{O} \quad \text{L} \\ 11 : 1 :: 240,00 \\ \hline 4 \overline{) 24000} \\ \underline{12} \quad 6000 \quad 11 \\ \underline{28} \quad 500 \quad 11 \quad \text{gr} \quad \text{lb} \\ \underline{28} \quad 220 \quad 11 = 1 = 211 \\ \underline{196} \\ 24 \end{array}$$

Barter



Barter

Section II

1. how many yards of linen at 50 cents per yard must be given for $6\frac{1}{4}$ yards of broad cloth at 11 dolls 50 cents per yard.

PL
1,50 dolls

$6\frac{1}{4}$
2400
1925

28,125

As C ya PL yds
As 50 : 1 :: 28,125 : 56 $\frac{1}{4}$ Ans.

2. A has 320 bushels of salt at 1 dollar 20 cents per bushel. for which B agrees to pay him 160 dollars in cash and the rest in coffee at 20 cents per pound: how much coffee must A receive: Ans. 1120 lb.

B PL B
1 : 120 :: 320

120
6400

320

38400

160

C ll
20 : 1 :: 22400

22400
1120 Ans

3. How much rye at 40 cents per bushel must be given for 28 bushels of wheat at 1 dollar 25 cents per bushel:

Ans. 50 bushels.

B PL B
1 : 125 :: 28

28

1000
CB 250

10 : 1 :: 3500

3500

50 bushels Ans

4. A barterers 319 lb. of coffee at 23 $\frac{1}{2}$ cents per pound with B for 250 yards of muslin: what does the muslin cost A per yard:

ll C Ans 30 cents nearly

1 : 23 $\frac{1}{2}$:: 319

23 $\frac{1}{2}$

957

638

1595

250 : 74,965 :: 1

250 74,965 (29,98 Ans

500

2496

2250

2465

2250

2150

2000

150

5. C has flour at 5 dollars per barrel, which he barterers to D at a profit of 20 per cent. for tea which cost 1 doll 25 cents per pound: at what rate must D sell the tea to make the barter equal: Ans. 1 doll. 50 cts. per lb.

100 : 120 :: 5

600

5 : 6 :: 125

750

1,50 Ans

Barter B

6. P has 240 bushels of rye which cost him 90 cents per bushel; this he barter with Q at 95 cents per bushel for wheat which stands 99 cents per bushel; how many

6. A has cloth which cost him 2 dollars 50 cents per yard. but in trade he must have 2 dollars 00 cents. B has wheat at 1 dollar 20 cents per bushel; at how much per bushel should he sell to A. to make the barter equal: Ans. 1 doll. 31 1/2 cts

$$\begin{array}{r} \text{Cl} \quad \text{Cl} \quad \text{Cl} \\ 250 : 280 :: 120 \\ \hline 250 \overline{) 33600} (134 \frac{2}{5} \text{ Ans} \\ \underline{250} \\ 860 \\ \underline{450} \\ 1100 \\ \underline{1000} \\ 100 \\ \underline{5} 100 = 2 \\ \underline{5} 250 = 5 \end{array}$$

7. P has 240 bushels of rye which cost him 9 cents per bushel; this he barter with Q at 95 cents per bushel for wheat which stands 99 cents per bushel; how many bushels of wheat is he to receive in barter and at what price, that their gains may be equal;

Ans. 218 2/3 bushels at 1 doll 11 1/2 cents per bushel.

$$\begin{array}{r} \text{C} \quad \text{C} \quad \text{C} \\ 90 : 95 :: 99 \\ \hline 95 \\ \underline{495} \\ 891 \\ 90 \overline{) 9405} (104 \frac{1}{2} \text{ price} \\ \underline{90} \\ 405 \\ \underline{360} \\ 45 \overline{) 45} = 1 \\ \underline{45} 90 = 2 \end{array}$$

$$\begin{array}{r} \text{B} \quad \text{C} \quad \text{B} \\ 1 : 95 :: 240 \\ \hline 95 \\ \underline{1200} \\ 2160 \\ 1045 : 1 :: 2280 \text{ or } 218 \frac{2}{3} \text{ Ans} \\ \underline{2090} \\ 1900 \\ \underline{1045} \\ 8550 \\ \underline{8360} \\ 5 \overline{) 190} = 38 \\ \underline{5} 1045 = 209 \end{array}$$

8. A gives B in barter 26 lb. 10 oz. of cinnamon, at 1 dollar 28 cents per pound, for rice at 6 cents per pound: how much rice must A receive: Ans. 5 cwt.

$$\begin{array}{r} \text{lb} \quad \text{Cl} \quad \text{lb oz} \\ \frac{1}{16} : 128 :: 26 \frac{1}{2} \\ \hline \frac{16}{16} \end{array}$$

$$\begin{array}{r} 160 \\ \underline{26} \\ 134 \\ \underline{128} \\ 60 \\ \underline{48} \\ 12 \\ \underline{12} \\ 0 \end{array}$$

$$\begin{array}{r} \text{C} \quad \text{A} \\ 6 : 1 :: 3360 \\ \hline 3360 \\ \underline{28} 560 (11) 20 \\ \underline{28} 560 \\ 0 \end{array}$$

Barter James

9. And Barter: C has muslin that cost him 22 cents per yard. and he puts it at 25 cents: D cost him 28 cents per yard. at what price must he put it to gain 10 per cent. more than C: Ans 35 cents per yard.

$$\begin{array}{r} C \quad D \quad C \\ 100 : 125 : : 28 \\ \hline 1000 \\ 250 \\ \hline 3500 \quad (35 \text{ cts per yard}) \\ 500 \\ \hline 500 \end{array}$$

10. A buys 250 barrels of flour from B at 6 dollars 25 cents per barrel, in payment B takes new of coffee at 30 cents per pound, 6 lbs of tea at 1 dollar 45 cents per lb. 25 yards of broad cloth at 6 dollars per yard, 206 dollars 10 cents in cash. and the balance in salt. at 8 dollars per barrel: how many barrels of salt must B receive:

Ans. 120 barrels

$$\begin{array}{r} B \quad D \quad B \\ 1 : 625 : : 250 \\ \hline 250 \end{array}$$

$$\begin{array}{r} 31250 \\ 1250 \\ \hline 156250 \\ 60250 \\ \hline 96000 \end{array}$$

$$\begin{array}{r} ll \quad C \quad ll \\ 1 : 30 : : 1128 \\ \hline 30 \\ 13440 \end{array}$$

$$\begin{array}{r} ll \quad D \quad ll \\ 1 : 175 : : 64 \\ \hline 64 \\ 700 \\ 1050 \\ \hline 11200 \end{array}$$

$$\begin{array}{r} yard \quad D \quad yards \\ 1 : 6 : : 25 \\ \hline 6 \\ 150 \end{array}$$

$$\begin{array}{r} 13440 \\ 11200 \\ 150 \\ \hline 20610 \\ 60250 \end{array}$$

$$\begin{array}{r} D \quad B \quad D \\ 8 : 1 : : 960 \\ \hline 120 \text{ barrels Ans} \end{array}$$

$$\begin{array}{r} C \\ 10 \overline{) 25} \\ 25 \\ \hline 22 : 27.5 : : 28 \\ \hline 2200 \\ 550 \\ \hline 22790.0 \quad (35 \text{ cts per yard}) \\ 66 \\ \hline 110 \\ 110 \end{array}$$

B. P.

Exchange

3rd Edition
 Case 1.

1. What is the value of 1800l. Pennsylvania currency in North Carolina

$$\begin{array}{r}
 \text{Pd } \$ \quad \$ \\
 46 : 8 :: 1800 \\
 \underline{20} \\
 9600 \\
 \underline{12} \\
 115200 \\
 90 \overline{) 921600} \\
 20 \overline{) 102400} \\
 \underline{512} \text{ Ans}
 \end{array}$$

2 What is the value of 256l. New York currency in Pennsylvania: Ans 240l.

$$\begin{array}{r}
 \$ \quad \$ \quad \$ \\
 8 : 46 :: 256 \\
 \underline{12} \quad \underline{20} \\
 90 \quad 5120 \\
 8 \overline{) 460800} \\
 12 \overline{) 54600} \\
 20 \overline{) 4800} \\
 \underline{240} \text{ Ans}
 \end{array}$$

3 How much South Carolina currency is equal to 1500l. of New Jersey Ans. 933l 6s 8d.

$$\begin{array}{r}
 \text{Pd } \$ \quad \$ \quad \$ \\
 46 : 48 :: 1500 \\
 \underline{12} \quad \underline{20} \\
 90 \quad 56 \quad 30000 \\
 \underline{12} \\
 360000 \\
 \underline{86} \\
 2160000 \\
 1800000 \\
 90 \overline{) 20160000} \\
 12 \overline{) 224000} \\
 20 \overline{) 186666} = 8 \\
 933 = 6 = 8 \text{ Ans}
 \end{array}$$

4. What sum New York currency is equal to 180l. in Massachusetts. Ans. 240l.

$$\begin{array}{r}
 \$ \quad \$ \quad \$ \\
 6 : 8 :: 180 \\
 \underline{20} \\
 3600 \\
 6 \overline{) 28800} \\
 20 \overline{) 4800} \\
 \underline{240} \text{ Ans}
 \end{array}$$

5. How much Virginia currency will purchase a bill for 280l. South Carolina. Ans 360l

$$\begin{array}{r}
 \text{Pd } \$ \quad \$ \quad \$ \\
 48 : 6 :: 280 \\
 \underline{12} \quad \underline{20} \\
 56 \quad 5600 \\
 \underline{12} \\
 67200 \\
 56 \overline{) 403200} \\
 \underline{392} \\
 112 \\
 \underline{112} \\
 00 \\
 20 \overline{) 7200} \\
 \underline{360} \text{ Ans}
 \end{array}$$

Exchange Exchange B

6. A bill of exchange being remitted from Rhode Island to South Carolina for 30 ul . what is its value in the currency of the latter: Ans 236 L . 8s. 10 $\frac{1}{2}$ d. +

$$\begin{array}{r}
 \text{S} \quad \text{Sd} \quad \text{f} \\
 6 : 118 : : 30 \text{ul} \\
 \frac{12}{56} \quad \frac{20}{6080} \\
 \frac{36480}{30400} \\
 6340480 \\
 12) 567116 = 2 \\
 20) 4728 = 10 \text{ Ans} \\
 236 = 8 = 10 \frac{1}{2}
 \end{array}$$

Case 2.

1. Change 12 ul . 12s. New England money to dollars and cents. 12 ul . 12s = 2552 shillings. The dollar. New England is

$$\begin{array}{r}
 65) 2552 \\
 125,33\frac{1}{3} \text{ Ans. } 125 \text{ dolls. } 33\frac{1}{3}
 \end{array}$$

2. Change 3 ul . 10s. Pennsylvania currency. to dollars.

$$\begin{array}{r}
 \text{f} \quad \text{S} \\
 37 \quad 10 \\
 \frac{20}{750} \\
 9) 9000 \\
 100,00 \text{ Ans}
 \end{array}$$

3. Change 22 ul . 12s. New York currency to federal money.

$$\begin{array}{r}
 22 \text{ul. } 12s. = 11512 \text{ shillings} : 8 \text{ the dollar New York currency} = 564 \text{ dolls. Ans.} \\
 \text{f} \quad \text{S} \\
 225 \quad 12 \\
 \frac{20}{8) 11512} \\
 564 \text{ Ans}
 \end{array}$$

4. A bill of exchange for 168 L . 19s. 6d. Virginia currency is remitted to Philadelphia. what is its value in federal money. Ans. 1563 dolls. 25 cts.

$$\begin{array}{r}
 \text{f} \quad \text{Sd} \quad \text{d} \\
 168 \quad 19 \quad 6 \\
 \frac{20}{9349} \\
 12) 112554 \\
 1563,25 \text{ Ans} \\
 105 \\
 360 \\
 155 \\
 132 \\
 2311 \\
 216 \\
 180 \\
 1111 \\
 360 \\
 360
 \end{array}$$

5. A merchant deposited in the United States branch bank at Pittsburgh. the sum of 450 L . 10s. Pennsylvania currency. for what sum may he draw for in federal money:

$$\begin{array}{r}
 \text{f} \quad \text{Ans. } 1563 \text{ dollars. } 25 \text{ cts} \\
 450 \quad 10 \\
 \frac{20}{15010} \\
 12) 1800120 \\
 1800 \\
 120 \\
 90 \\
 3000 \\
 270 \\
 300 \\
 270 \\
 30
 \end{array}$$

Foreign Exchange C & X

III Case 3 III

1. Philadelphia is indebted to London 1494 l. currency, what sum sterling must be remitted when the exchange is 65 percent.

$$\begin{array}{r} 165 : 100 :: 1494 \\ 165 \overline{) 149400} \quad 1060 \text{ Ans} \\ \underline{165} \\ 990 \\ \underline{990} \\ 0 \end{array}$$

2. London is indebted to Philadelphia 1060 l. Sterling what sum Pennsylvania currency must be remitted, the exchange being 65 percent. as above:

$$\begin{array}{r} 100 : 165 :: 1060 \\ 165 \overline{) 106000} \\ \underline{165} \\ 5300 \\ \underline{5300} \\ 6360 \\ \underline{6360} \\ 660 \\ 100 \overline{) 174900} \quad 1749 \text{ Ans} \\ \underline{100} \\ 749 \\ \underline{700} \\ 490 \\ \underline{400} \\ 900 \\ \underline{900} \\ 0 \end{array}$$

Baltimore Oct. 1814.

Exchange for 1260 l. 10 s. sterling, thirty days after sight of this my first of exchange second and third of like tenor and date not being paid. pay to Mr. B. or order. twelve hundred and sixty pounds ten shillings sterling value received, and place the same to account as per advice from.

W. S. L. Merchant. London.

What is the value of the bill in Federal money. 1260 l. 10 s. 12605 + by 111 cents = 5596 dolls. 62 cts. Ans.

$$\begin{array}{r} \text{L} \quad \text{S} \quad \text{D} \quad \text{C} \quad \text{S} \quad \text{S} \\ 1 : 111 :: 1260 \quad 10 \\ \underline{20} \quad \underline{20} \\ 20 \quad 25210 \\ \underline{111} \\ 100840 \\ 100840 \\ 100840 \end{array}$$

$$\begin{array}{r} 11193240 \\ 559662 \end{array} \quad \text{Ans}$$

Exchange for 5596 dolls 62 cts. Federal money. thirty days after sight of this my second of exchange first and third of the same tenor and date not paid. pay to J. B. or order five thousand five hundred and ninety six dolls sixty two cents value received. and place the same to account. as per advice from

S. S. Mr. J. S. Merchant. Baltimore

How much sterling is the above bill. 111 cents to the pound

$$\begin{array}{r} 111 \overline{) 559662} \quad 1260 \\ \underline{111} \\ 1156 \\ \underline{111} \\ 488 \\ \underline{488} \\ 2686 \\ \underline{2664} \\ 222 \\ \underline{20} \\ 111010 \text{ Ans. } 1260.10 \\ \underline{111} \\ 0 \end{array}$$

Foreign Exchange Exco

15. A merchant of Philadelphia & In a settlement between A of London and B of Philadelphia. B is receiving from his correspondent in Dublin a bill of exchange for 540l. 15s. Irish currency what is its value in federal money.

Ans 2217dolls. 7½cts.

$$\begin{array}{r} \text{£} \quad \text{£} \quad \text{£} \quad \text{£} \\ 1 : 110 :: 540.15 \\ \hline 20 \\ 20 \\ \hline 10818 \\ 110 \\ \hline 108130 \\ 43260 \\ \hline 20) 44341.50 \\ \hline 2217.075 \end{array}$$

Ans 2217.075

sterling what sum must remitted by B to A to settle the balance. the exchange being 12½ percent from the United States to Great Britain Ans. 1598dolls. 40cts.

$$\begin{array}{r} \text{£} \quad \text{£} \\ 320 \\ 12\frac{1}{2} \\ \hline 3840 \\ 160 \\ \hline 4000 \\ 320 \\ \hline 360 \end{array} \quad \begin{array}{r} \text{£} \\ 1111 \\ 360 \\ \hline 26640 \\ 1332 \\ \hline 1598.40 \end{array}$$

6. A merchant in Philadelphia draws on his correspondent in Dublin for the balance of an account amounting to 2217 dollars 7½cts. what sum Irish currency must be remitted to satisfy the draft.

Ans. 540l. 15s.

$$\begin{array}{r} \text{£} \quad \text{£} \quad \text{£} \quad \text{£} \\ 110 : 1 :: 2217.075 \\ \hline 1 \end{array}$$

$$\begin{array}{r} 110) 2217.075 \\ \hline 2050 \\ 1640 \\ 1640 \\ \hline 307.5 \\ 20 \\ \hline 110) 6150015 \\ \hline 410 \\ 2050 \\ 2050 \end{array}$$

Ans 54015

8. C of New York remits 3280 dollars to his correspondent in Dublin. to be placed to his account: for what sum Irish currency must he receive credit. the course of exchange being 8 percent in favour of Ireland.

Ans. 436l. nearly.

$$\begin{array}{r} 3280 \\ 26240 \\ 110) 301460 \\ \hline 2870 \\ 1476 \\ 1280 \\ \hline 2460 \\ 2460 \end{array}$$

FFL

Alligation

Section 1. case 1.

1. A merchant mixed 2 gallons of wine at 2 dollars per gallon, 2 at 2 dollars 50 cents, and 2 at 3 dollars: what is one gallon of this mixture worth?

G.

$$2 \text{ at } 2.00 = 400$$

$$2 \text{ at } 2.50 = 500$$

$$2 \text{ at } 3.00 = 600$$

$$\hline 6 \quad 1500$$

$$\text{As } 6 : 15,00 :: 1 : 2,50 \text{ Ans.}$$

2. A grocer mixed 20 lb. of sugar at 10 cents per lb. 3 lb. at 15 cents, and 10 lb. at 25 cents; what is one pound of this mixture worth?

ll C Qc Ans. 18½ cts.

$$20 \text{ at } 10 = 200$$

$$3 \text{ at } 15 = 450$$

$$10 \text{ at } 25 = 1000$$

$$\hline 90 \quad 16,50$$

$$\text{ll } 90 : 1650 :: 1$$

$$90 \overline{) 1650} (18\frac{1}{2} \text{ Ans}$$

$$\begin{array}{r} 180 \\ 120 \\ \hline 3 \overline{) 30} = 10 \end{array}$$

3. A trader mixes 10 bushels of at 150 cents, 20 at 160 cents, and 30 at 140 cents per bushel: at what rate can he afford to sell one bushel of this mixture. Ans. 163½ cents.

B

$$10 \text{ at } 150 = 1500$$

$$20 \text{ at } 160 = 3200$$

$$30 \text{ at } 140 = 5100$$

$$\hline 60 \quad 9800$$

$$\text{B } 60 : 9800 :: 1$$

$$60 \overline{) 9800} (163\frac{1}{2} \text{ Ans}$$

$$\hline 380$$

$$\hline 360$$

$$\hline 200$$

$$\hline 180$$

$$2 \overline{) 20} = 10$$

4. if 11 ounces of silver at 45 cents per ounce, be melted with 8 ounces at 60 cents per ounce, what is the value of one ounce of this mixture?

Ans. 65 cents.

$$\text{oz } 11 \text{ at } 45 = 300$$

$$8 \text{ at } 60 = 480$$

$$\hline 12 \quad 780$$

$$\text{oz } 12 : 780 :: 1$$

$$12 \overline{) 780} (65 \text{ Ans}$$

$$\hline 60$$

$$\hline 60$$

Alligation

Case 2.

1. How many pounds of tea at 150, 160, and 200 cents per pound must be mixed together, that one pound may be sold for 180 cents:

Mean rate 180

150	20 at 150
160	20 at 160
200	30 + 20 = 50 at 200

150	20
3000	
3200	
100	

160	20
3200	

90: 162.00::1

50
100

90 162.00
1.80 Proof

2. how many gallons of wine at 3, 5, and 6 dollars per gallon, must be mixed together, that one gallon may be worth 4 dollars; Ans. 3 gal. at 3 dolls. 1 gal. at 5 dolls. and 1 gallon at 6 dolls

	Gal	Doll
3	1 + 2 = 3	at 3
5	1	at 5
6	1	at 6

3. how many bushels of rye at 40 cents per bushel, and corn at 30 cents, must be mixed with oats at 20 cents, to make a mixture worth 25 cents per bushel:

	Bush	Cts
40	5 + 5 = 20	at 40
30	5	at 30
20	5	at 20

A grocer has four several sorts of tea. viz. one kind at 120 cents, another at 110 cents, another at 90 cents, and another at 80 cents per pound. how much of each sort must be taken to make a mixture worth 1 dollar per pound:

1 100 { 120 2
110 1
90 1
80 2 } Ans

2 100 { 120 2 + 1 = 3
110 2
90 2
80 2 + 1 = 3 } Ans

3 100 { 120 1
110 2
90 2
80 1 } Ans

4 100 { 120 1
110 2 + 1 = 3
90 1 + 2 = 3
80 1 } Ans

5 100 { 120 2 + 1 = 3
110 1
90 1 + 2 = 3
80 2 } Ans

6 100 { 120 2
110 2 + 1 = 3
90 1
80 2 + 1 = 3 } Ans

240
330
90
240

900
100 Cents

Proof

Allegation

James McCormick
W.B.

SSS Case 3. SSS

1. A grocer would mix 100 pounds of sugar at 22 cents per pound, with some at 20, 14, and 12 cents per pound. how much of each sort must he take to mix with the 100 pounds, that he may sell the mixture at 18 cents per pound:

12	—	14
14	—	2
20	—	4
22	—	6

6 : 110 : : 11

6 $\overline{) 160}$ (26.666... at 12 cts and 20

12

40

36

40

36

40

36

40

6: 40 :: 2

$$\begin{array}{r} 2 \\ 6 \overline{) 80} \quad (13.33 \text{ ll. at 14 cents} \\ \underline{6} \\ 20 \\ \underline{18} \\ 20 \\ \underline{18} \\ 20 \\ \underline{18} \\ 2 \end{array}$$

2. How much wheat at 18 cents, rye at 36 cents, and barley at 30 cents per bushel, must be mixed with 24 bushels of oats at 18 cents per bushel, that the whole may rate at 22 cents per bushel:
Ans. 2 bushels of each.

$$\begin{array}{r} 18 \\ 22 \overline{) 30} \\ \underline{36} \\ 48 \end{array} \quad - 26 + 14 + 8 = 18$$

$$118: 24 :: 11$$

$\frac{11}{48} \overline{) 96}$ 2 bushels of each

3. How much gold at 16, 20,
and 24 carats fine, and how
much alloy must be mixed
with 10 ounces of 18 carats fine,
that the composition may be
22 carats fine:

Ans. 1003. of 16 carats fine, 10
of 20 140 of 24 and 10 of alloy.

$$\begin{array}{r}
 16 \\
 18 \\
 22 \left\{ \begin{array}{l} 20 \\ 24 \\ 00 \end{array} \right.
 \end{array}$$

$$-6 + 4 + 2 + 22 = 34$$

$$2:10::2$$

$$\begin{array}{r} 2 \overline{) 20} \\ 100\% \end{array}$$

$$2:10::34$$

$$\begin{array}{r} 2 \overline{) 340} \\ \underline{170} \end{array}$$

Alligation Last

Case 4.

1. How much sugar a 10. 12, and 15 cents per pound. will be required make a mixture of 40 pounds. worth 13 cents per pound:

$$\begin{array}{r} 10 \\ 12 \\ 15 \end{array} \begin{array}{r} 2 \\ 2 \\ 1 \end{array} \begin{array}{r} 2 \\ 2 \\ 1 \end{array}$$

Sum of the different simples.

Ans 8: 40 :: 2
 $\frac{80}{10}$ lb.

Ans 8: 40 :: 11
 $\frac{880}{20}$ do.

Ans 8: 40 :: 2
 $\frac{80}{10}$ do.

2. How much gold of 15. of 14. of 18, and of 22 carats fine. must be mixed together to form a mixture of 40 ounces of 20 carats fine: Ans. 503. of 15. of 14. and of 18. and 2503. of 22.

$$\begin{array}{r} 15 \\ 14 \\ 18 \\ 22 \end{array} \begin{array}{r} 2 \\ 2 \\ 2 \\ 2 \end{array} \begin{array}{r} 2 \\ 2 \\ 2 \\ 2 \end{array}$$

$$-5+3+2=10$$

16: 40 :: 2

$\frac{16}{80}$ 503. of

16: 40 :: 10

$\frac{16}{32}$ 2503 of

3. How many gallons of water must be mixed with wine at 6 dollars per gallon. to fill a vessel 40 gallons. so that it may be sold without loss at 5 dollars per gallon.

Ans. 11 $\frac{2}{3}$ gallons of water.

Ans 6: 70 :: 1
 $\frac{6}{60}$ 5

Ans 6: 70 :: 1
 $\frac{6}{70}$ 11 $\frac{2}{3}$ Ans
 $\frac{10}{6} = \frac{2}{3}$

at Last

vulgar Fractions

Case 1.

1. Reduce $\frac{36}{48}$ to its lowest terms.

$$\begin{array}{r} 36 \overline{) 48} 1 \\ \underline{36} \\ 12 \overline{) 36} 3 \\ \underline{36} \\ 12 \overline{) 48} 4 \\ \underline{48} \end{array} \quad \frac{3}{4} \text{ Ans}$$

2. Reduce $\frac{144}{216}$ to its lowest terms. Ans $\frac{2}{3}$

$$\begin{array}{r} 144 \overline{) 216} 1 \\ \underline{144} \\ 72 \\ 72 \overline{) 144} 2 \\ \underline{144} \\ 72 \overline{) 216} 3 \\ \underline{216} \end{array} \quad \frac{2}{3} \text{ Ans}$$

3. Reduce $\frac{75}{125}$ to its lowest terms. Ans. $\frac{3}{5}$

$$\begin{array}{r} 75 \overline{) 125} 1 \\ \underline{75} \\ 50 \overline{) 75} 1 \\ \underline{50} \\ 25 \overline{) 125} 5 \\ \underline{125} \\ 25 \overline{) 75} 3 \\ \underline{75} \end{array} \quad \frac{3}{5} \text{ Ans}$$

4. Reduce $\frac{4800}{10800}$ to its lowest terms. Ans. $\frac{4}{9}$

$$\begin{array}{r} 4800 \overline{) 10800} 2 \\ \underline{9600} \\ 12 \overline{) 4800} 4 \\ \underline{48} \\ 12 \overline{) 10800} 9 \\ \underline{10800} \end{array} \quad \frac{4}{9} \text{ Ans}$$

5. Reduce $\frac{91}{117}$ to its lowest terms. Ans. $\frac{7}{9}$

$$\begin{array}{r} 91 \overline{) 117} 1 \\ \underline{91} \\ 26 \overline{) 91} 3 \\ \underline{78} \\ 13 \overline{) 117} 9 \\ \underline{117} \\ 13 \overline{) 91} 7 \\ \underline{91} \end{array} \quad \frac{7}{9} \text{ Ans}$$

6. Reduce $\frac{9876}{8888}$ to its lowest terms. Ans. $\frac{1}{9}$

$$\begin{array}{r} 9876 \overline{) 8888} 9 \\ \underline{8888} \end{array}$$

Case 2.

Handwritten signature or large flourish.

Reduction of vulgar fractions

1. Reduce $8\frac{3}{4}$ to an improper fraction.

$$\begin{array}{r} 8 \\ 4 \\ \hline 32 + 3 = 35 \\ \hline \end{array} \text{Ans}$$

III Case 3. III

1. Reduce $\frac{35}{4}$ to its proper terms.

$$\begin{array}{r} 1) 35 (8\frac{3}{4} \text{ Ans} \\ 32 \\ \hline 3 \end{array}$$

2. Reduce $12\frac{15}{14}$ to an improper fraction. Ans. $\frac{219}{14}$

$$\begin{array}{r} 12 \\ 14 \\ \hline 84 \\ 12 \\ \hline 204 + 15 = 219 \\ \hline \end{array} \text{Ans}$$

2. Reduce $\frac{3848}{21}$ to its proper terms. Ans $183\frac{5}{21}$

$$\begin{array}{r} 2) 3848 (183\frac{5}{21} \text{ Ans} \\ 21 \\ \hline 174 \\ 168 \\ \hline 68 \\ 63 \\ \hline 5 \end{array}$$

3. Reduce $183\frac{5}{21}$ to an improper fraction. $\frac{3848}{21}$ Ans

$$\begin{array}{r} 183 \\ 21 \\ \hline 183 \\ 366 \\ \hline 3843 + 5 = 3848 \\ \hline \end{array} \text{Ans}$$

3. Reduce $\frac{2465}{7}$ to its proper terms.

$$\begin{array}{r} 7) 2465 (352\frac{1}{7} \text{ Ans} \\ 245 \\ \hline 15 \end{array}$$

4. Reduce $514\frac{5}{16}$ to an improper fraction. $\frac{8229}{16}$ Ans

$$\begin{array}{r} 514 \\ 16 \\ \hline 3084 \\ 514 \\ \hline 8224 + 5 = 8229 \\ \hline \end{array} \text{Ans}$$

4. Reduce $\frac{961}{17}$ to its proper terms. Ans $56\frac{9}{17}$

$$\begin{array}{r} 17) 961 (56\frac{9}{17} \text{ Ans} \\ 85 \\ \hline 111 \\ 102 \\ \hline 9 \end{array}$$

5. Reduce $68425\frac{3}{4}$ to an improper fraction. $\frac{273703}{4}$ Ans

$$\begin{array}{r} 68425 \\ 4 \\ \hline 273700 + 3 = 273703 \\ \hline \end{array} \text{Ans}$$

5. Reduce $\frac{8229}{16}$ to its proper terms. Ans $514\frac{5}{16}$

$$\begin{array}{r} 16) 8229 (514\frac{5}{16} \text{ Ans} \\ 80 \\ \hline 22 \\ 16 \\ \hline 69 \\ 64 \\ \hline 5 \end{array}$$

Reduction of Vulgar Fractions

Journal of William H. Miller

Case No. 111

1. 1000 ft. of ...

2. 1000 ft. of ...

3. 1000 ft. of ...

4. 1000 ft. of ...

5. 1000 ft. of ...

6. 1000 ft. of ...

7. 1000 ft. of ...

8. 1000 ft. of ...

Case No. 112

9. 1000 ft. of ...

1. 1000 ft. of ...

2. 1000 ft. of ...

3. 1000 ft. of ...

4. 1000 ft. of ...

5. 1000 ft. of ...

6. 1000 ft. of ...

7. 1000 ft. of ...

8. 1000 ft. of ...

9. 1000 ft. of ...

10. 1000 ft. of ...

11. 1000 ft. of ...

12. 1000 ft. of ...

13. 1000 ft. of ...

14. 1000 ft. of ...

15. 1000 ft. of ...

16. 1000 ft. of ...

Reduction of Vulgar Fractions

Case 4.

1 Reduce $\frac{1}{2}$ $\frac{2}{3}$ $\frac{3}{4}$ to a common denominator.

$$\left. \begin{array}{l} 1 \times 3 \times 4 = 12 \\ 2 \times 2 \times 4 = 16 \\ 3 \times 2 \times 3 = 18 \\ 2 \times 3 \times 4 = 24 \end{array} \right\} \begin{array}{l} \text{numerators} \\ \text{common denominator} \end{array} \text{ for}$$

Ans. $\frac{12}{24}$ $\frac{16}{24}$ $\frac{18}{24}$

2 Reduce $\frac{3}{4}$ $\frac{4}{5}$ $\frac{5}{6}$ to a common denominator.

$$\left. \begin{array}{l} 3 \times 5 \times 6 = 90 \\ 4 \times 4 \times 6 = 96 \\ 5 \times 4 \times 5 = 100 \\ 4 \times 5 \times 6 = 120 \end{array} \right\}$$

Ans $\frac{90}{120}$ $\frac{96}{120}$ $\frac{100}{120}$

3 Reduce $\frac{1}{3}$ $\frac{2}{5}$ $\frac{4}{15}$ $\frac{5}{9}$ to a common denominator.

$$\left. \begin{array}{l} 1 \times 5 \times 15 \times 9 = 675 \\ 3 \times 3 \times 15 \times 9 = 1215 \\ 4 \times 3 \times 5 \times 9 = 540 \\ 5 \times 3 \times 5 \times 15 = 1125 \\ 3 \times 5 \times 15 \times 9 = 2025 \end{array} \right\}$$

Ans $\frac{675}{2025}$ $\frac{1215}{2025}$ $\frac{540}{2025}$ $\frac{1125}{2025}$

Case 5.

PL

1 Reduce $\frac{1}{2}$ $\frac{2}{3}$ $\frac{5}{6}$ $\frac{4}{8}$ to the least common denominator.

$$\begin{array}{r} 3 \overline{) 2368} \\ \underline{2128} \\ 1114 \times 2 \times 3 = 24 \end{array}$$

Divisors $\left\{ \begin{array}{l} 2 \times 12 = 24 \\ 3 \times 8 = 24 \\ 6 \times 4 = 24 \\ 8 \times 3 = 24 \end{array} \right.$

then $\frac{12}{24}$ $\frac{16}{24}$ $\frac{20}{24}$ $\frac{21}{24}$ Ans.

2. Reduce $\frac{2}{3}$ $\frac{3}{8}$ $\frac{4}{12}$ $\frac{5}{20}$ to the least common denominator.

$$\begin{array}{r} 4 \overline{) 381220} \\ 3 \overline{) 3235} \\ \underline{1215} \\ 1030 \\ \underline{304} \\ 304 \end{array}$$

Divisors $\left\{ \begin{array}{l} 4 \times 2 = 8 \\ 8 \times 15 = 120 \\ 12 \times 10 = 120 \\ 20 \times 6 = 120 \end{array} \right.$

Ans $\frac{80}{120}$ $\frac{45}{120}$ $\frac{40}{120}$ $\frac{30}{120}$

3. Reduce $\frac{1}{3}$ $\frac{2}{5}$ $\frac{4}{15}$ $\frac{5}{9}$ to the least common denominator.

$$\begin{array}{r} 3 \overline{) 35159} \\ \underline{1553} \\ 11135 \\ \underline{15} \\ 3 \end{array}$$

Divisors $\left\{ \begin{array}{l} 3 \times 15 = 45 \\ 5 \times 9 = 45 \\ 15 \times 3 = 45 \\ 9 \times 5 = 45 \end{array} \right.$

Ans $\frac{15}{45}$ $\frac{27}{45}$ $\frac{12}{45}$ $\frac{25}{45}$

Viguer Fractions

Case 6.

1. Reduce $\frac{2}{3}$ of $\frac{3}{11}$ of $\frac{11}{5}$ to a single fraction.

$$\frac{2 \times 3 \times 11 = 21}{3 \times 11 \times 5 = 60} = \frac{2}{5} \text{ Ans}$$

Of cancelled

$$\frac{2 \cancel{3} \cancel{11}}{3 \cancel{11} 5} = \frac{2}{5} \text{ Ans}$$

2. Reduce $\frac{7}{8}$ of $\frac{11}{6}$ of $\frac{9}{10}$ to a single fraction.

$$\frac{7 \times 11 \times 9 = 252}{8 \times 6 \times 10 = 480} = \frac{21}{110} \text{ Ans}$$

3. Reduce $\frac{5}{9}$ of $\frac{11}{8}$ of $\frac{3}{11}$ to a single fraction.

$$\frac{5 \cancel{11} 3 = 15}{9 \times 8 \cancel{11} = 72} = \frac{5}{24} \text{ Ans}$$

4. Reduce $\frac{5}{9}$ of $\frac{11}{7}$ of $\frac{11}{12}$ to a single fraction.

$$\frac{5 \times 11 \times 11 = 220}{9 \times 7 \times 12 = 756} = \frac{55}{189} \text{ Ans}$$

Case 7.

1. Reduce $\frac{5}{6}$ of a penny to the fraction of a pound.

$$\frac{5 \times 1 \times 1}{6 \times 12 \times 20} = \frac{5}{1440} = \frac{1}{288} \text{ Ans}$$

2. Reduce $\frac{11}{5}$ of a pennyweight to the fraction of a pound troy.

$$\frac{11 \times 1 \times 1}{5 \times 20 \times 12} = \frac{11}{1200} = \frac{1}{300} \text{ Ans}$$

3. Reduce $\frac{9}{13}$ of a pint of wine to the fraction of a hogs head.

$$\frac{9 \times 1}{13 \times 50 \cancel{11}} = \frac{9}{6552} = \frac{1}{728} \text{ Ans}$$

4. Reduce $\frac{10}{11}$ of a minute to the fraction of a day.

$$\frac{10 \times 1}{11 \times 1440} = \frac{10}{15840} = \frac{1}{1584} \text{ Ans}$$

Cases

S P
L P

7
7
2
H
W
H

Reduction of Vulgar fractions 8

1. Reduce $\frac{5}{1140}$ of a pound to the fraction of a penny.

$$\begin{array}{r} 20 \\ 12 \\ \hline 240 \\ 5 \\ \hline 12 \overline{) 1200} \text{ } 10 - 5 \text{ Ans} \\ \underline{1140} \quad 12 - 6 \end{array}$$

2. Reduce $\frac{1}{300}$ of a pound troy to the fraction of a penny weight.

$$\begin{array}{r} 120 \\ 240 \\ \hline 6 \overline{) 300} \text{ } 11 - 5 \text{ Ans} \end{array}$$

3. Reduce $\frac{1}{428}$ of a hogshead to the fraction of a pint. Ans. $\frac{9}{13}$

$$\begin{array}{r} 63 \\ 11 \\ \hline 2511 \\ 2 \\ \hline 8 \overline{) 5011} \text{ } 63 - 9 \text{ Ans} \\ \underline{428} \quad 91 - 13 \end{array}$$

4. Reduce $\frac{1}{1584}$ of a day to the fraction of a minute. Ans. $\frac{10}{11}$

$$\begin{array}{r} 240 \\ 60 \\ \hline 6 \overline{) 1440} \text{ } 240 - 10 \text{ Ans} \\ \underline{1584} \quad 2611 - 11 \end{array}$$

Case 9.

TS

1. What is the value of $\frac{2}{3}$ of a pound sterling

$$\begin{array}{r} 20 \text{ shilling} = 1 \text{ pound.} \\ 2 \\ \hline 3 \overline{) 110} \text{ } 13.11 \text{ Ans. } 13 \text{ s. } 11 \text{ d.} \end{array}$$

2. Reduce $\frac{2}{3}$ of a pound troy to proper quantity. Ans. 40 gr. 12 dwts

$$\begin{array}{r} 12 \\ 3 \\ \hline 5 \overline{) 36} \text{ } 40 \text{ gr. } 12 \text{ dwts. Ans.} \end{array}$$

3. Reduce $\frac{4}{5}$ of a mile to its proper quantity. Ans. 6 fur. 16 p.

$$\begin{array}{r} 8 \\ 11 \\ \hline 5 \overline{) 32} \text{ } 6 \text{ fur. } 16 \text{ p. Ans.} \end{array}$$

4. Reduce $\frac{3}{10}$ of a day to its proper time.

$$\begin{array}{r} 24 \\ 3 \\ \hline 10 \overline{) 72} \text{ } 7 \text{ h. } 12 \text{ mi. Ans.} \end{array}$$

5. What is the value of $\frac{4}{5}$ of a dollar. Ans. 80 cts.

$$\begin{array}{r} 100 \\ 11 \\ \hline 5 \overline{) 400} \text{ } 80 \text{ cts Ans} \end{array}$$

Case 10.

TS

Reduction of Vulgar fractions

Case 11.

1. Reduce 6s. 8d. to the fraction of a pound

s	d
6	8
12	20
12	12
240	

$$80 \overline{) 80} = \frac{1}{3} \text{ Ans}$$

1. Reduce $\frac{3}{4}$ to a decimal fraction of the same value

$$\overline{) 300} \begin{array}{l} 75 \\ 75 \end{array} \text{ Ans.}$$

2 Reduce 25 cents to the fraction of a dollar.

$$25 \overline{) 25} = \frac{1}{4} \text{ Ans}$$

2. Reduce $\frac{17}{20}$ to a decimal fraction. Ans. .85.

$$20 \overline{) 17} \begin{array}{l} 85 \\ 170 \end{array} \text{ Ans}$$

3. Reduce 31 gallons 2 quarts to the fraction of a hogs head. Ans. $\frac{1}{2}$.

gal	qr
31	2
4	63
4	1
252	

$$126 \overline{) 126} = \frac{1}{2} \text{ Ans.}$$

4. Reduce 6 hundred weight 2 quarters 18 $\frac{2}{3}$ pounds to the fraction of a ton. Ans. $\frac{1}{3}$.

cwt	qr	lb
6	2	18 $\frac{2}{3}$
16	1	20
16	20	1
26	80	
28	28	
226	640	
52	160	
1116	2240	
3	6720	

$$2240 \overline{) 2240} = \frac{1}{3} \text{ Ans}$$



Addition of Sugar Fractions

Case 1. sss

1. Add $\frac{1}{12} \frac{5}{12} \frac{7}{12} \frac{9}{12}$ and $\frac{11}{12}$ together
numerators.

$$\begin{array}{r} 1 \\ 5 \\ 7 \\ 9 \\ 11 \\ 12 \overline{) 33} (2 \frac{3}{4} \text{ Ans} \\ 24 \\ \hline 9 - 3 \\ 12 - 11 \end{array}$$

2. Add $\frac{4}{25} \frac{8}{25} \frac{13}{25} \frac{16}{25}$ and $\frac{19}{25}$ together.

$$\begin{array}{r} 4 \\ 8 \\ 13 \\ 16 \\ 19 \\ 25 \overline{) 60} (2 \frac{2}{5} \text{ Ans} \\ 50 \\ \hline 10 - 2 \\ 25 - 5 \end{array}$$

3. Add $\frac{15}{60} \frac{25}{60} \frac{45}{60}$ and $\frac{55}{60}$ together.

$$\begin{array}{r} 15 \\ 25 \\ 45 \\ 55 \\ 60 \overline{) 140} (2 \frac{1}{3} \text{ Ans} \\ 120 \\ \hline 20 - 1 \\ 60 - 3 \end{array}$$

Case 2. sss

1. Add $\frac{3}{4} \frac{5}{8} \frac{9}{12}$ together.

$$\begin{array}{r} 2 \overline{) 24812} \\ 2 \overline{) 1246} \\ 1123 \end{array}$$

$$\begin{array}{r} 2 \\ 6 \\ 2 \\ 12 \end{array}$$

$$\begin{array}{l} 2 \overline{) 24} \\ 12 \times 1 = 12 \\ 11 \quad 6 \times 1 = 18 \\ 8 \quad 3 \times 1 = 15 \\ 12 \quad 2 \times 1 = 18 \end{array}$$

$$\begin{array}{r} 24 \overline{) 63} (2 \frac{15}{24} \text{ Ans} \\ 48 \\ \hline 15 \\ 24 \end{array}$$

2. Add $\frac{1}{2} \frac{1}{4} \frac{1}{5} \frac{1}{8}$ together.

$$\begin{array}{r} 2 \overline{) 2458} \\ 2 \overline{) 1254} \\ 1152 \end{array}$$

$$\begin{array}{r} 5 \\ 10 \\ 2 \\ 20 \\ 2 \end{array}$$

$$\begin{array}{l} 2 \overline{) 40} \\ 20 \times 1 = 20 \\ 110 \times 1 = 10 \\ 5 \quad 8 \times 1 = 8 \\ 8 \quad 5 \times 1 = 5 \end{array}$$

$$\begin{array}{r} 40 \overline{) 43} (1 \frac{3}{40} \text{ Ans} \\ 40 \\ \hline 3 \\ 40 \end{array}$$

K

Addition of Vulgar fractions

3. Add $\frac{4}{5} \frac{5}{6} \frac{6}{7} \frac{8}{15}$ Together.

$$\begin{array}{r} 5 \overline{) 567815} \\ 2 \overline{) 16783} \\ 3 \overline{) 137113} \\ \hline 117111 \end{array}$$

$$\begin{array}{r} 117111 \\ 28 \\ 3 \\ 84 \\ 2 \\ \hline 168 \end{array}$$

$$\begin{array}{l} 5 \overline{) 840} \\ 168 \times 5 = 840 \\ 6140 \times 5 = 700 \\ 7120 \times 6 = 720 \\ 8105 \times 3 = 315 \\ 1556 \times 8 = 118 \end{array}$$

$$\begin{array}{r} 840 \overline{) 2855} \quad 367 \text{ Ans} \\ 2520 \\ \hline 335 \\ 5 \overline{) 840} = 168 \end{array}$$

Case 3.

1. Add $13\frac{1}{15} 9\frac{4}{15} 3\frac{7}{15}$ Together.

$$\begin{array}{r} 13\frac{1}{15} \\ 9\frac{4}{15} \\ 3\frac{7}{15} \\ \hline 25\frac{12}{15} = 26\frac{4}{5} \text{ Ans} \end{array}$$

2. Add $5\frac{2}{3} 6\frac{7}{8} 11\frac{1}{2}$ Together.

$$\begin{array}{l} 5\frac{2}{3} = 5\frac{16}{24} \text{ Com. denom} \\ 6\frac{7}{8} = 6\frac{21}{24} \\ 11\frac{1}{2} = 11\frac{12}{24} \end{array}$$

$$\begin{array}{r} 119 \\ 24 \\ \hline 152 \\ 24 \\ \hline 17\frac{1}{24} \text{ Ans} \end{array}$$

3. Add $1\frac{2}{3} \frac{4}{5}$ of $\frac{1}{3}$ $9\frac{2}{20}$ Together.

$$\frac{4}{5} \text{ of } \frac{1}{3} = \frac{4}{15}$$

$$\begin{array}{r} 5 \overline{) 315} \\ 1311 \\ \hline 125 \end{array}$$

$$\begin{array}{l} 5 \overline{) 60} \\ 12 \times 3 = 136 \\ 15 \times 11 = 166 \\ 20 \times 3 = 99 \end{array}$$

$$11\frac{1}{16} \text{ Ans}$$

11. Add $19\frac{6}{8} 6\frac{7}{8} \frac{2}{3}$ of $\frac{1}{2}$ $7\frac{1}{2}$ Together.

$$\frac{2}{3} \frac{1}{2} 2 \frac{2}{6} = \frac{1}{3}$$

$$\begin{array}{r} 9711 \\ 2 \overline{) 10832} \\ 5431 \end{array}$$

$$\begin{array}{r} 5431 \\ 3 \\ 12 \\ 60 \end{array}$$

$$\begin{array}{l} 10 \overline{) 120} \\ 12 \times 9 = 108 \\ 8 \times 15 = 6105 \\ 3 \times 18 = 110 \\ 2 \times 60 = 760 \end{array}$$

$$16\frac{73}{120} \text{ Ans}$$

$$\begin{array}{r} 120 \overline{) 3132} \\ 240 \\ \hline 73 \end{array}$$

Addition of Vulgar Fractions

Case 1.

1. Add $\frac{7}{9}$ of a £. and $\frac{3}{10}$ of a shilling. and $\frac{1}{2}$ of an hour together.

Ans. 2 days 14 hours 30 min.

$$\begin{array}{r} 20 \\ 9 \overline{) 140} \\ 15 \end{array} \quad \begin{array}{r} 6 \frac{6}{9} = \frac{2}{3} \\ 10 \overline{) 36} \\ 36 = 3 \\ 10 = 5 \end{array}$$

$$\begin{array}{r} 7 \\ 3 \overline{) 7} \\ 2 \dots 8 \dots 00 \\ 0 \dots 6 \dots 30 \\ 2 \dots 14 \dots 30 \text{ Ans} \end{array} \quad \begin{array}{r} 24 \\ 12 \overline{) 24} \\ 6 \end{array} \quad \begin{array}{r} 260 \\ 30 \end{array}$$

$$\begin{array}{r} \frac{2}{3} \quad \frac{3}{5} \\ 3 \overline{) 15} \\ 5 \times 2 = 10 : 6 \frac{10}{15} \\ 5 \quad 3 \times 3 = 00 : 3 : 15 \\ 15 : 10 \frac{4}{15} \text{ Ans} \end{array}$$

5. Add $\frac{7}{8}$ of a mile. $\frac{2}{3}$ of a yard, and $\frac{3}{4}$ of a foot together. Ans. 1540 yards 2 feet 9 inches.

2. Add $\frac{1}{2}$ of a yard to $\frac{2}{3}$ of a foot.

Ans. 2 feet 2 inches

$$\begin{array}{r} 3 \\ 2 \overline{) 3} \\ 1 \dots 6 \\ 2 \dots 2 \text{ Ans} \end{array} \quad \begin{array}{r} 12 \\ 3 \overline{) 24} \\ 8 \end{array}$$

$$\begin{array}{r} 1769 \\ 8 \overline{) 12320} \\ 1540 : 2 : 9 \text{ Ans} \end{array} \quad \begin{array}{r} 3 \\ 3 \overline{) 6} \\ 2 \end{array} \quad \begin{array}{r} 12 \\ 1 \overline{) 36} \\ 9 \end{array}$$

Section 3.

3. Add $\frac{1}{3}$ of a day to $\frac{1}{2}$ of an hour.

Ans. 8 hours 30 min.

$$\begin{array}{r} 24 \\ 3 \overline{) 24} \\ 8 \end{array} \quad \begin{array}{r} 60 \\ 2 \overline{) 60} \\ 30 \end{array}$$

$$\begin{array}{r} \frac{1}{3} \text{ of a day} = 8 \dots 00 \\ \frac{1}{2} \text{ of one hour} = \dots 30 \\ 8 \dots 30 \text{ Ans} \end{array}$$

SL
H
SLa

Subtraction of Vulgar fractions

From $\frac{7}{8}$
Take $\frac{3}{8}$
Rem. $\frac{4}{8} = \frac{1}{2}$ Ans.

From $\frac{6}{7}$
Take $\frac{3}{7}$
Rem. $\frac{3}{7}$ Ans.

From $\frac{2}{3} = \frac{8}{12}$
Take $\frac{1}{4} = \frac{3}{12}$
 $\frac{5}{12}$ Ans.

From $\frac{11}{12}$
Take $\frac{3}{11}$
Rem. $\frac{1}{6}$

From $\frac{15}{16}$
Take $\frac{11}{12}$
Rem. $\frac{1}{48}$

$4 \overline{) \frac{11}{12} \frac{3}{11}}$
 $\frac{3}{1}$

$11 \overline{) \frac{15}{16} \frac{11}{12}}$
 $\frac{3}{3}$

$12 \overline{) 12}$
 $1 \times 11 = \frac{11}{12}$
 $4 \cdot 3 \times 3 = \frac{9}{12}$

$16 \overline{) 18}$
 $3 \times 15 = \frac{45}{18}$
 $12 \quad 11 \times 11 = \frac{121}{18}$

$\frac{2}{12} = \frac{1}{6}$ Ans

$\frac{1}{48}$ Ans

From $\frac{5}{6}$
Take $\frac{4}{5}$
Rem. $\frac{1}{30}$

From $12 \frac{5}{12}$
Take $6 \frac{1}{2}$
Rem. $5 \frac{11}{12}$

$6 \overline{) 30}$
 $5 \times 5 = \frac{25}{30}$
 $5 \quad 6 \times 1 = \frac{6}{30}$

$2 \overline{) 12 \frac{5}{12} \frac{1}{2}}$
 $\frac{6}{1}$

$\frac{1}{30}$ Ans

$12 \overline{) 12}$
 $1 \times 5 = 12 \frac{5}{12}$
 $2 \quad 6 \times 1 = 6 \frac{6}{12}$

$5 \frac{11}{12}$ Ans

From $\frac{209}{216}$
Take $\frac{7}{111}$

From $13 \frac{1}{4}$
Take $8 \frac{14}{24}$
Rem. $4 \frac{16}{24}$

$9 \overline{) 24}$
 $\frac{14}{3}$

Rem $\frac{397}{432}$

$9 \overline{) 24}$
 $3 \times 1 = 13 \frac{3}{24}$
 $24 \quad 1 \times 14 = 8 \frac{14}{24}$

$4 \frac{16}{24}$ Ans

$2 \overline{) 209} \quad \frac{7}{111}$
 $9 \overline{) 216} \quad \frac{72}{72}$
 $4 \overline{) 12} \quad \frac{8}{2}$

$216 \overline{) 432}$
 $2 \times 209 = \frac{418}{432}$
 $111 \quad 3 \times 7 = \frac{21}{432}$

$\frac{397}{432}$ Ans

Subtraction of Vulgar Fractions

From $10\frac{3}{10}$
Take $1\frac{7}{12}$
Rem $8\frac{13}{60}$

$$\begin{array}{r} 2\overline{)10\frac{3}{10}} \quad \frac{1}{12} \\ \underline{5} \quad 6 \\ 6 \\ 30 \\ \underline{2} \\ 10\overline{)60} \\ 8 \times 3 = 10\frac{18}{60} \\ 12 \quad 5 \times 7 = 1\frac{35}{60} \end{array}$$

$8\frac{13}{60}$ Ans

From $\frac{7}{4}$ of a L. = $15\frac{2}{3}$
Take $\frac{3}{10}$ of a L. = $0\frac{3}{5}$

$$\begin{array}{r} 15\frac{3\frac{1}{5}}{15} \\ \text{Rem } \frac{20}{4} \quad \frac{12}{3} \\ 9\overline{)140} \text{ (3)} \quad 10\overline{)36} \text{ (2)} \\ \underline{15} \quad 6 \quad 6 \quad 2 \quad \underline{3} \quad 6 \quad 3 \\ 15:6\frac{10}{15} \quad 3:10\frac{3}{5} \end{array}$$

$15:6\frac{10}{15}$

$0\frac{3}{5}$

$15:3\frac{1}{5}$ Ans

From $19\frac{5}{11}$
Take $0\frac{7}{15}$
Rem. $18\frac{163}{165}$

$$\begin{array}{r} 5 \quad 7 \\ 11 \overline{)15} \quad 15 \\ \underline{5} \quad 5 \\ 11 \\ 11\overline{)165} \\ 15 \times 5 = 19\frac{75}{165} \\ 15 \quad 11 \times 7 = 0\frac{77}{165} \end{array}$$

$18\frac{163}{165}$ Ans

From 7 weeks
Take $9\frac{7}{10}$ days

Rem. 5 w. 4 d. 7 h. 12 mi

$$\begin{array}{r} 24 \\ 10\overline{)168} \\ \underline{16} : 118 \end{array}$$

w	d	h	mi
7	0	0	0
0	9	16	118

5 4 7 12 Ans

$$\begin{array}{r} 24 \\ 10\overline{)168} \\ \underline{16} \quad 80 \\ \text{min } 118.0 \end{array}$$

$7\overline{)1}$
1.2 days

w	d	h	mi
7	0	00	00
1	2	16	118
5	4	7	12

Ans

Multiplication of Vulgar fraction

Section 1111

1. Multiply $\frac{2}{3}$ by $\frac{1}{4}$.

$$\frac{2 \times 1 = 2}{3 \times 4 = 12} = \frac{1}{6} \text{ Ans}$$

2. Multiply $4\frac{1}{2}$ by $\frac{1}{8}$.

$$\frac{4\frac{1}{2}}{2} = \frac{9 \times 1 = 9}{2 \times 8 = 16} \text{ Ans.}$$

3. Multiply $\frac{3}{8}$ by $\frac{4}{5}$. Ans $\frac{3}{10}$

$$\frac{3 \times 4 = 12 = 3}{8 \times 5 = 40 = 10} \text{ Ans}$$

4. Multiply $\frac{2}{5}$ of $\frac{3}{4}$ by $\frac{1}{2}$ Ans $\frac{3}{20}$

$$\frac{2}{5} \text{ of } \frac{3}{4} = \frac{6}{20} = \frac{3}{10}$$

$$\frac{3 \times 1 = 3}{10 \times 2 = 20} \text{ Ans}$$

5. Multiply $4\frac{1}{2}$ by $\frac{1}{4}$. Ans $1\frac{1}{8}$

$$\frac{4\frac{1}{2}}{2} = \frac{9 \times 1 = 9}{15 \times 1 = 15}$$

$$2 \times 4 = 8 \mid 15 \begin{matrix} 17 \\ 8 \\ 7 \\ 8 \end{matrix} \text{ Ans}$$

6. Multiply $\frac{9}{11}$ by $\frac{3}{4}$. Ans $5\frac{29}{32}$

$$\frac{9}{3} \mid \frac{27}{4} = \frac{6 \frac{3}{4}}{11} = \frac{27 \times 4 = 108}{11 \times 8 = 88}$$

$$11 \times 8 = 88 \mid 108 \begin{matrix} 12 \\ 160 \\ 29 \\ 32 \end{matrix} \text{ Ans}$$

7. Multiply $48\frac{3}{5}$ by $135\frac{6}{10}$ Ans $642\frac{3}{10}$

$$\frac{48\frac{3}{5}}{5} = \frac{243 \times 83 = 20169}{5 \times 6 = 30}$$

$$5 \times 6 = 30 \mid 20169 \begin{matrix} 180 \\ 216 \\ 210 \\ 69 \\ 60 \\ 3 \end{matrix} \text{ Ans}$$

Decorative flourish consisting of multiple stylized 'S' and 'P' shapes.

Division of Vulgar Fractions James McCormick

1. Divide $\frac{3}{8}$ by $\frac{2}{3}$.

$$\frac{3 \times 3}{8 \times 2} = \frac{9}{16} \text{ Ans}$$

2. Divide $1\frac{1}{2}$ by $1\frac{2}{3}$.

$$\frac{1\frac{1}{2}}{\frac{2}{3}} = \frac{3}{2} \times \frac{3}{2} = \frac{9}{4} = 2\frac{1}{4} \text{ Ans}$$

3. Divide $\frac{14}{21}$ by $\frac{3}{8}$.

3. Divide $\frac{3}{8}$ by $\frac{6}{4}$. Ans. $\frac{21}{48}$

$$\frac{3 \times 6}{8 \times 4} = \frac{21}{48} \text{ Ans}$$

4. Divide $1\frac{1}{2}$ by $1\frac{8}{10}$ Ans. $1\frac{22}{63}$

$$\frac{1\frac{1}{2}}{1\frac{8}{10}} = \frac{3}{2} \times \frac{10}{8} = \frac{30}{16} = 1\frac{22}{63} \text{ Ans}$$

5. Divide $\frac{7}{8}$ by 11 . Ans. $\frac{5}{16}$

$$\frac{\frac{7}{8}}{11} = \frac{7}{8} \times \frac{1}{11} = \frac{7}{88} = \frac{5}{16} \text{ Ans}$$

6. Divide $\frac{7}{8}$ by 11 . Ans. $\frac{7}{32}$

$$\frac{\frac{7}{8}}{11} = \frac{7}{8} \times \frac{1}{11} = \frac{7}{88} = \frac{7}{32} \text{ Ans}$$

7. Divide $9\frac{1}{6}$ by $\frac{1}{2}$ of 4 . Ans. $2\frac{13}{21}$

$$\frac{9\frac{1}{6}}{\frac{1}{2} \times 4} = \frac{55 \times 2}{110}$$

$$\frac{2 \times 7}{3 \times 2} = \frac{14}{6}$$

$$6 \times 7 = 42 \quad 110 \div 42 = 2\frac{13}{21}$$

$$2 \times \frac{13}{21} = \frac{26}{21}$$

8. Divide $5205\frac{1}{5}$ by $\frac{4}{5}$ of 91 . Ans. $71\frac{1}{2}$

$$\frac{5205\frac{1}{5}}{\frac{4}{5} \times 91} = \frac{26026 \times 5}{5 \times 364}$$

$$\frac{91}{\frac{4}{5}} = \frac{91 \times 5}{4} = \frac{455}{4} = 113\frac{3}{4}$$

$$\frac{130130}{1820} = 71\frac{1}{2} \text{ Ans}$$

The Rules Three In vulgar Fractions

Section 6. SSS

1. If $\frac{1}{4}$ of a yard of cloth cost $\frac{2}{3}$ of a dollar: what will $\frac{7}{8}$ of a yard come to: *Ans*

$$\frac{1}{4} : \frac{2}{3} :: \frac{7}{8} : \frac{56}{24} 2\frac{1}{3} \text{ Ans}$$

2. If $\frac{2}{3}$ of a ton of iron cost $16\frac{1}{2}$ dollars: what will $\frac{1}{4}$ of a ton come to: *Ans* 211 dollars 28 $\frac{1}{2}$ cts.

$$\frac{2}{3} : 16\frac{1}{2} :: \frac{1}{4} : \frac{11}{8}$$

$$\begin{array}{r} 3 \times 1193 \times 6 \\ 2 \times 3 \times 7 \\ 3 \\ 6 \\ 7 \\ 42 \end{array}$$

$$1193 \times 6 = 7158$$

$$7158 \div 42 = 170\frac{1}{2}$$

$$170\frac{1}{2} \times \frac{1}{4} = 42\frac{3}{8}$$

$$42\frac{3}{8} \times 21 = 886\frac{3}{4}$$

$$886\frac{3}{4} \div 4 = 221\frac{3}{4}$$

3. A person having $\frac{3}{4}$ of a coal mine, sells $\frac{3}{4}$ of his share for 141 dollars: what is the value of the whole mine at the same rate: *Ans* 380 dollars.

$$\frac{3}{4} \text{ of } \frac{3}{4} = \frac{9}{16} : \frac{141}{1} :: \frac{1}{1}$$

$$\frac{141}{20} \div \frac{9}{16} = 380 \text{ dollars Ans}$$

4. At $\frac{5}{6}$ of a dollars per yard what will 42 yards come to: *Ans* 35 dollars.

$$\frac{5}{6} : \frac{42}{1} :: \frac{1}{1}$$

$$6 \overline{) 210} \text{ Ans.}$$

5. A gentleman owing $\frac{2}{3}$ of a vessel, sells $\frac{2}{3}$ of his share for 312 dollars: what is the whole vessel worth: *Ans* 1170 dollars.

$$\frac{2}{3} \text{ of } \frac{2}{3} : \frac{312}{1} :: \frac{1}{1}$$

$$\frac{312}{15} \times 11 = 1170 \text{ Ans}$$

6. If $1\frac{1}{2}$ bushels of apples cost 49 $\frac{1}{2}$ cents: what will $3\frac{2}{3}$ bushels cost at the same rate: *Ans* 202 $\frac{3}{10}$ cents.

$$\frac{1\frac{1}{2}}{1} : \frac{49\frac{1}{2}}{1} :: \frac{3\frac{2}{3}}{1}$$

$$\frac{49\frac{1}{2}}{1} \times \frac{3\frac{2}{3}}{1} = 202\frac{3}{10}$$

$$60 \overline{) 1250} \text{ Ans}$$

in the place 3

4. If $\frac{1}{5}$ of a ship be worth 175 dollars 35 cents, what part of her may be purchased for 601 dollars 20 cents: Ans. $\frac{3}{4}$.

$$\frac{175.35}{1} : \frac{1}{5} :: \frac{601.20}{1}$$

~~140280~~

$$20040 \overline{) 60120} = 3 \text{ Ans}$$

$$\begin{array}{r} 60120 \overline{) 140280} \\ 120240 \\ \hline 20040 \end{array}$$

Inverse Proportion.

Section 7.

1. How much shall on $\frac{3}{4}$ yards it take 16 men to do the same wide, will line $\frac{1}{2}$ yards of cloth work: Ans. $28\frac{1}{2}$ days.

$$\frac{1\frac{1}{2}}{1\frac{1}{2}} = \frac{3}{2} \text{ then } \frac{3}{2} : \frac{9}{2} :: \frac{2}{1}$$

$$\text{Or inverted } \frac{3}{2} : \frac{9}{2} :: \frac{14}{3} = \frac{108}{12} = 9 \text{ Ans}$$

3. If 12 men can finish a piece of work in $34\frac{3}{4}$ days; how long will it take 16 men to do the same

$$\begin{array}{r} 34\frac{3}{4} \\ 12 \cdot \frac{188}{5} \cdot \frac{16}{1} \\ \hline 16 \\ 30 \\ 50 \\ 80 \end{array} \quad \begin{array}{r} 188 \\ 12 \\ \hline 2256 \end{array} \quad \begin{array}{r} 28\frac{1}{2} \text{ Ans} \\ 160 \\ 656 \\ 640 \\ \hline 16 \\ 80 \end{array}$$

2. If $6\frac{1}{2}$ hundred weight be carried $22\frac{2}{3}$ miles for 25 dollars. how far may 1 hundred weight be carried for the same money:

$$\begin{array}{ccc} \text{cwt} & \text{M} & \text{Ans.} \\ 6\frac{1}{2} : 22\frac{2}{3} :: 1 & & 145\frac{1}{4} \text{ miles.} \end{array}$$

$$\begin{array}{r} 13 \\ 2 \\ \hline 52 \end{array} \quad \begin{array}{r} 144 \\ 144 \\ \hline 581 \\ 26 \\ \hline 52 \end{array}$$

$$\begin{array}{r} 581 \\ 13 \\ \hline 1443 \\ 581 \\ \hline 52 \overline{) 7553} \\ 52 \\ \hline 235 \\ 208 \\ \hline 243 \\ 260 \\ \hline 13 \overline{) 13} = 1 \\ 52 \overline{) 52} = 1 \end{array} \text{ Ans}$$

4. A lends to B 100 dollars for $6\frac{2}{3}$ months; what sum should B lend to A for 35 years, to requite his kindness. Ans. 111 $\frac{122}{207}$ dol

$$\begin{array}{ccc} \text{M} & \text{D} & \text{years} \\ 6\frac{2}{3} : 100\frac{2}{3} : 35 \\ 20 : 302 : 121 \\ 3 : 3 : 1 \end{array} \quad \begin{array}{r} 111 \\ 138 \\ 3 \\ \hline 111 \end{array} \quad \begin{array}{r} 122 \\ 207 \end{array}$$

6. In exchanging $20\frac{1}{2}$ yards of cloth of $\frac{1}{4}$ yard wide for some of the same quality of $\frac{3}{4}$ yards wide, what quantity of the latter makes an equal barter. Ans. $31\frac{1}{6}$ yards.

Ans. $17\frac{4}{7}$ feet long.

$$\begin{array}{r} 20\frac{1}{2} \\ \times 41 \\ \hline 205 \\ 820 \\ \hline 8410 \end{array}$$

$$\begin{array}{r} 14 \\ \hline 5 \\ \hline 14 \\ \hline 2 \\ \hline 8 \\ \hline 3 \\ \hline 24 \end{array}$$

Evolution or The raising of Powers

Section 1.

1. What is the 3d power of 15:

$15 \times 15 \times 15 = 3375$ Ans.

$$\begin{array}{r} 15 \\ 15 \\ \hline 75 \\ 15 \\ \hline 225 \\ 15 \\ \hline 1125 \\ 225 \\ \hline 3375 \text{ Ans} \end{array}$$

2. What is the 4th power of 35:

$Ans. 1500625.$

$$\begin{array}{r} 35 \\ 35 \\ \hline 1225 \\ 105 \\ \hline 1225 \\ 35 \\ \hline 6125 \\ 3675 \\ \hline 112875 \\ 35 \\ \hline 214375 \\ 128625 \\ \hline 1500625 \text{ Ans.} \end{array}$$

3. What is the 3d power of 1.03:

$Ans. 1.092727.$

$$\begin{array}{r} 1.03 \\ 1.03 \\ \hline 3.09 \\ 1030 \\ \hline 1.0609 \\ 1.03 \\ \hline 3.1827 \\ 106090 \\ \hline 1.092727 \text{ Ans} \end{array}$$

4. What is the 5th power of

$.029: Ans. .000000704281.$

$$\begin{array}{r} .029 \\ .029 \\ \hline 261 \\ 58 \\ \hline .000841 \\ .029 \\ \hline 7569 \\ 1682 \\ \hline .000024389 \\ .029 \\ \hline \end{array}$$

219501

48778

$.000000707281$

5. What is the 4th power of $\frac{3}{4}$:

$Ans. \frac{81}{256}$

$3 \times 3 \times 3 \times 3 = 81$

$4 \times 4 \times 4 \times 4 = 256$

Ans

The Square Root

Section 3.

1. What is the square root of 531441

$$\begin{array}{r}
 531441 \quad (729 \text{ Ans.} \\
 49 \overline{) 531441} \\
 \underline{411} \\
 1204 \\
 149 \overline{) 1204} \\
 \underline{119} \\
 1151 \\
 149 \overline{) 1151} \\
 \underline{119} \\
 61 \\
 149 \overline{) 61} \\
 \underline{149} \\
 0
 \end{array}$$

proof

2. What is the square root of 106929: Ans. 327.

$$\begin{array}{r}
 106929 (327 \text{ Ans} \\
 9 \overline{) 106929} \\
 \underline{81} \\
 259 \\
 62 \overline{) 259} \\
 \underline{124} \\
 135 \\
 62 \overline{) 135} \\
 \underline{124} \\
 11
 \end{array}$$

3. What is the square root of 4782969: Ans. 2187.

$$\begin{array}{r}
 4782969 (2187 \text{ Ans.} \\
 41 \overline{) 4782969} \\
 \underline{41} \\
 6729 \\
 428 \overline{) 6729} \\
 \underline{3424} \\
 3305 \\
 4364 \overline{) 330569} \\
 \underline{330569} \\
 0
 \end{array}$$

4. What is the square root of 13046421: Ans. 6561.

$$\begin{array}{r}
 13046421 (6561 \text{ Ans} \\
 36 \overline{) 13046421} \\
 \underline{125} \\
 5421 \\
 125 \overline{) 5421} \\
 \underline{45} \\
 967 \\
 1306 \overline{) 967} \\
 \underline{7836} \\
 1831 \\
 13121 \\
 13121 \\
 0
 \end{array}$$

5 What is the square root of 384420489 Ans. 19613.

$$\begin{array}{r}
 384420489 (19613 \text{ Ans} \\
 1 \overline{) 384420489} \\
 \underline{29} \\
 844 \\
 29 \overline{) 844} \\
 \underline{261} \\
 1832 \\
 386 \overline{) 1832} \\
 \underline{2316} \\
 5164 \\
 3928 \overline{) 5164} \\
 \underline{3142} \\
 2022 \\
 39363 \overline{) 2022} \\
 \underline{118089} \\
 831
 \end{array}$$

6 What is the square root of 22041204 Ans. 4698.

$$\begin{array}{r}
 22041204 (4698 \text{ Ans} \\
 16 \overline{) 22041204} \\
 \underline{8} \\
 1404 \\
 86 \overline{) 1404} \\
 \underline{516} \\
 888 \\
 929 \overline{) 888} \\
 \underline{8361} \\
 519 \\
 9388 \overline{) 519} \\
 \underline{45104} \\
 6796
 \end{array}$$

7. What is the square root of 36372961: Ans. 6031.

$$\begin{array}{r}
 36372961 (6031 \text{ Ans} \\
 36 \overline{) 36372961} \\
 \underline{1203} \\
 2429 \\
 1203 \overline{) 2429} \\
 \underline{3609} \\
 820 \\
 12061 \overline{) 820} \\
 \underline{12061} \\
 0
 \end{array}$$

2

The Square Root

8. What is the square root of 2268441: Ans. 1506.23+

$$\begin{array}{r}
 2268441 (1506.23+ \text{Ans} \\
 25 \overline{)126} \\
 \underline{125} \\
 18441 \\
 3006 \overline{)18036} \\
 \underline{18036} \\
 30122 \overline{)10500} \\
 \underline{60244} \\
 1025600 \\
 30124 \overline{)903729} \\
 \underline{121841}
 \end{array}$$

9. What is the square root of 7596796: Ans. 2756.228+

$$\begin{array}{r}
 7596796 (2756.228+ \text{Ans} \\
 44 \overline{)359} \\
 \underline{329} \\
 545 \overline{)3067} \\
 \underline{2725} \\
 5506 \overline{)34296} \\
 \underline{33036} \\
 55122 \overline{)126000} \\
 \underline{110244} \\
 551242 \overline{)1545600} \\
 \underline{1102484} \\
 5512448 \overline{)47311600} \\
 \underline{44099584} \\
 3212016
 \end{array}$$

10 What is the square root of 9712.718051 Ans. 98.553+

$$\begin{array}{r}
 9712.718051 (98.553+ \text{Ans} \\
 81 \\
 188 \overline{)1612} \\
 \underline{1504} \\
 1965 \overline{)10841} \\
 \underline{9825} \\
 19405 \overline{)104680} \\
 \underline{98525} \\
 197103 \overline{)615551} \\
 \underline{591309} \\
 24242
 \end{array}$$

11. What is the square root of 3.1421812: Ans. 1.78106+

$$\begin{array}{r}
 3.14218120 (1.78106+ \text{Ans} \\
 27 \overline{)214} \\
 \underline{189} \\
 348 \overline{)2821} \\
 \underline{2484} \\
 3561 \overline{)3481} \\
 \underline{3561} \\
 356206 \overline{)2202000} \\
 \underline{2137836} \\
 64164
 \end{array}$$

12. What is the square root of 4795.25431: Ans. 69.247+

$$\begin{array}{r}
 4795.254310 (69.247+ \text{Ans} \\
 36 \\
 129 \overline{)1195} \\
 \underline{1161} \\
 1832 \overline{)3425} \\
 \underline{2764} \\
 13844 \overline{)66173} \\
 \underline{55376} \\
 138484 \overline{)1079710} \\
 \underline{969299} \\
 110411
 \end{array}$$

Square Root James McNick

13. What is the square root of .00008836. Ans. .00944

$$\begin{array}{r} .00008836 \text{ (Ans. .00944)} \\ 81 \overline{) 81} \\ 184 \overline{) 736} \\ \underline{436} \end{array}$$

3. What is the square root of

$$\begin{array}{r} 15625. \text{ Ans. } 125 \\ 46656. \text{ } 216 \end{array}$$

$$\begin{array}{r} 15625 (125 \\ 22 \overline{) 56} \\ 44 \overline{) 1225} \\ 245 \overline{) 1225} \\ \underline{1225} \end{array} \quad \frac{125}{216} \text{ Ans}$$

$$\begin{array}{r} 46656 (216 \\ 4 \overline{) 66} \\ 41 \overline{) 2556} \\ 426 \overline{) 2556} \end{array}$$

Examples

1. What is the square root of $\frac{2304}{5184}$. Ans. $\frac{2}{3}$

$$\begin{array}{r} 2304 \text{ (Ans. } \frac{4}{9} \\ 576 \overline{) 5184} \end{array}$$

$$\begin{array}{r} 2 \overline{) 4} (2 \text{ Ans} \\ 8 \overline{) 9} (3 \end{array}$$

2. What is the square root of $\frac{2704}{4225}$. Ans. $\frac{4}{5}$

$$\begin{array}{r} 2704 \text{ (Ans. } \frac{16}{25} \\ 169 \overline{) 4225} \end{array}$$

$$\begin{array}{r} 16 \overline{) 25} (5 \text{ Ans} \\ 25 \overline{) 25} \end{array}$$

Surds

What is the square root of $\frac{3571}{1176}$. Ans. 86602+

$$\begin{array}{r} 1176 \overline{) 3570} (45 \\ 3332 \overline{) 2380} \\ 2380 \end{array}$$

75 (86602+ Ans

$$\begin{array}{r} 166 \overline{) 1100} \\ 996 \overline{) 10400} \\ 1726 \overline{) 10356} \end{array}$$

$$\begin{array}{r} 17320,2 \overline{) 1110000} \\ 346404 \overline{) 93596} \end{array}$$

Square Root James M. Muck

5. What is the square root of

$$\frac{8706439526}{81} \cdot \frac{148}{549} \text{ Ans. } 93308+$$

$$\begin{array}{r} 8706439526 \cdot 93308+ \text{ Ans} \\ 81 \\ 183 \overline{) 606} \\ \underline{549} \\ 1863 \overline{) 5473} \\ \underline{5589} \\ 186609 \overline{) 1849526} \\ \underline{1679481} \\ \underline{1700115} \end{array}$$

6. What is the square root of

$$\frac{387}{738} \cdot \text{Ans. } 72411+ \text{ Ans.}$$

$$\begin{array}{r} 5243902439 \cdot 72411+ \text{ Ans.} \\ 49 \\ 142 \overline{) 343} \\ \underline{284} \\ 1444 \overline{) 5990} \\ \underline{5776} \\ 14481 \overline{) 21421} \\ \underline{14481} \\ 694339 \\ 144824 \overline{) 579296} \\ \underline{115043} \end{array}$$

Examples.

1. What is the square root of

$$\frac{3736}{119} \cdot \text{Ans. } 6\frac{1}{4}.$$

$$\begin{array}{r} 3736 \\ 119 \overline{) 3736} \\ \underline{339} \\ 151 \\ 1849 \\ \underline{1194} \\ 119 \end{array}$$

$$\begin{array}{r} 1849 \cdot 6\frac{1}{4} \text{ Ans} \\ 16 \\ 83 \overline{) 219} \\ \underline{219} \end{array}$$

2. What is the square root of $34\frac{36}{119}$

$$\text{Ans. } 6\frac{1}{4}.$$

$$\begin{array}{r} 27\frac{9}{16} \\ 171 \\ 27 \\ 441 \\ 16 \overline{) 16} \\ 16 \end{array} \quad \begin{array}{r} 1111(21 \\ 4 \overline{) 44} \\ 16 \overline{) 16} \\ 16 \overline{) 16} \end{array} \quad \begin{array}{r} 21(5\frac{1}{4} \text{ Ans} \\ 10 \\ 20 \\ 1 \end{array}$$

3. What is the square root of $51\frac{21}{25}$

$$\text{Ans. } 7\frac{1}{5}.$$

$$\begin{array}{r} 51\frac{21}{25} \\ 2525 \\ 256 \\ 1296 \\ 25 \overline{) 25} \\ 25 \end{array} \quad \begin{array}{r} 1296(36 \\ 9 \overline{) 9} \\ 6,6 \overline{) 396} \\ 35 \overline{) 35} \end{array} \quad \begin{array}{r} 36(7\frac{1}{5} \text{ Ans} \\ 35 \\ 1 \end{array}$$

4. What is the square root of $9\frac{113}{119}$

$$\text{Ans. } 3\frac{1}{4}.$$

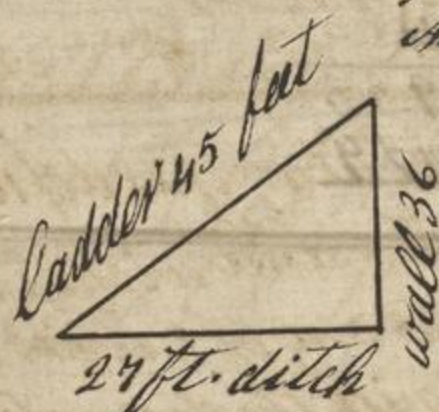
$$\begin{array}{r} 9\frac{113}{119} \\ 84 \\ 119 \overline{) 119} \\ 119 \end{array} \quad \begin{array}{r} 119(4 \\ 119 \overline{) 119} \\ 119 \end{array} \quad \begin{array}{r} 484(22 \\ 4 \overline{) 48} \\ 119 \overline{) 119} \\ 119 \end{array} \quad \begin{array}{r} 22(3\frac{1}{4} \text{ Ans} \\ 21 \\ 1 \end{array}$$

Square Root James Marmick

Example. III

1. The wall of a fort is 36 feet high, and the ditch before it is 27 feet wide, it is required to find the length of a ladder that will reach to the top of the wall from the opposite side of the ditch.

Ans. 45 feet.



$$\begin{array}{r}
 36 \\
 36 \\
 \hline
 216 \\
 108 \\
 \hline
 1296 \\
 729 \\
 \hline
 2025 \text{ (45 Ans.)} \\
 16 \\
 \hline
 8.5 \overline{) 425} \\
 425 \\
 \hline
 \end{array}$$

$$\begin{array}{r}
 27 \\
 27 \\
 \hline
 189 \\
 54 \\
 \hline
 729
 \end{array}$$

2. The top of a castle from the ground is 45 yards high, and is surrounded with a ditch 60 yards broad, what length must a cable be to reach from the outside of the ditch to the top of the castle: Ans. 75 yards.

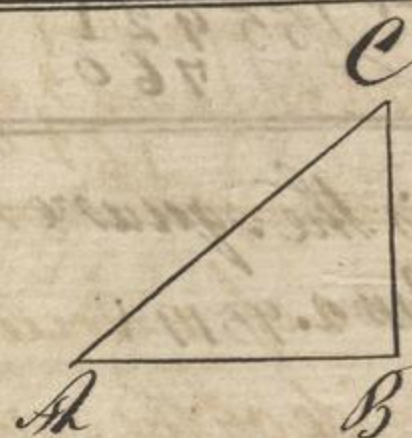
$$\begin{array}{r}
 45 \\
 45 \\
 \hline
 225 \\
 180 \\
 \hline
 2025 \\
 3600 \\
 \hline
 5625 \text{ (75 Ans.)} \\
 49 \\
 \hline
 145 \overline{) 725} \\
 725 \\
 \hline
 \end{array}$$

3. In a right angled triangle.

AB C, the hypotheruse line

AC is 45 feet, the base AB 27 feet; required the length of the perpendicular line BC: Ans. 36 feet.

$$\begin{array}{r}
 45 \\
 45 \\
 \hline
 225 \\
 180 \\
 \hline
 2025 \\
 729 \\
 \hline
 1296 \text{ (36 Ans.)} \\
 9 \\
 \hline
 6.6 \overline{) 396} \\
 396 \\
 \hline
 \end{array}$$



4. In the right angled triangle

AB C, the line AC is 75 feet, BC 45 feet; required the length of the line AB: Ans. 60 feet.

$$\begin{array}{r}
 75 \\
 75 \\
 \hline
 375 \\
 525 \\
 \hline
 5625 \\
 2025 \\
 \hline
 3600 \text{ (60 Ans.)} \\
 36 \\
 \hline
 12 \overline{) 0000}
 \end{array}$$

[Decorative flourish]

Square Root



Examples

1. If the content of a given circle be 160. what is the side of the square equal. Ans. 12.64911+

$$\begin{array}{r}
 160(12.64911+ \text{Ans.} \\
 22 \overline{) 60} \\
 \underline{44} \\
 1600 \\
 246 \overline{) 1600} \\
 \underline{1496} \\
 10400 \\
 2524 \overline{) 10400} \\
 \underline{10096} \\
 30400 \\
 2528.9 \overline{) 30400} \\
 \underline{227601} \\
 763900 \\
 25298.1 \overline{) 763900} \\
 \underline{252981} \\
 10091900 \\
 252982.1 \overline{) 10091900} \\
 \underline{2529821} \\
 162079
 \end{array}$$

2. If the area of a circle be 2025, what is the side of the square equal.

Ans. 45

2025(45 Ans.

$$\begin{array}{r}
 8.5 \overline{) 1125} \\
 \underline{1125}
 \end{array}$$

3. If the area of a circle be 450. what is the side of the square equal:

Ans. 21.2132+

450(21.2132+ Ans

$$\begin{array}{r}
 44 \overline{) 350} \\
 \underline{329} \\
 2100 \\
 543 \overline{) 2100} \\
 \underline{1629} \\
 47100 \\
 546.8 \overline{) 47100} \\
 \underline{43744} \\
 335600 \\
 5476.6 \overline{) 335600} \\
 \underline{328596} \\
 700400 \\
 54772.1 \overline{) 700400} \\
 \underline{544421} \\
 15267900 \\
 547722.2 \overline{) 15267900} \\
 \underline{10954444} \\
 4313456
 \end{array}$$

Examples

1. There is a circle whose diameter is 4 feet; what is the diameter of one 4 times as large Ans. 8 feet.

$$\begin{array}{r}
 4 \\
 4 \\
 \hline
 16 \\
 4 \\
 \hline
 64 \quad 8 \text{ Ans.} \\
 64
 \end{array}$$

2. A has a circular yard of 100 feet diameter. but wishes to enlarge it to one of 3 times that area; what will the diameter of the enlarged be one measure.

Ans. 173.2+

$$\begin{array}{r}
 100 \\
 100 \\
 \hline
 10000 \\
 3 \\
 \hline
 30000 \\
 2.7 \overline{) 200} \\
 \underline{189} \\
 1100 \\
 34.3 \overline{) 1100} \\
 \underline{1029} \\
 7100 \\
 346.2 \overline{) 7100} \\
 \underline{6924} \\
 176
 \end{array}$$

3. If the diameter of a circle be 12 inches, what will be the diameter of another circle of half the size.

Ans. 8.48+ inches.

$$\begin{array}{r}
 12 \\
 2 \overline{) 1111} \\
 \underline{72} \\
 49 \\
 64 \\
 \hline
 165 \overline{) 800} \\
 \underline{660} \\
 14000 \\
 168.8 \overline{) 14000} \\
 \underline{13504} \\
 496
 \end{array}$$

Square Square Root

1. What 1. When the area is 160
what is the diameter. Ans. 14.2729474

$$\begin{array}{r}
 160 (12.64911+ \\
 22 \overline{) 60} \\
 \underline{44} \\
 246 \overline{) 1600} \\
 \underline{1476} \\
 2524 \overline{) 12400} \\
 \underline{10096} \\
 25289 \overline{) 230400} \\
 \underline{227601} \\
 25298.1 \overline{) 249900} \\
 \underline{252981} \\
 252982.1 \overline{) 2691900} \\
 \underline{2529821}
 \end{array}$$

$$\begin{array}{r}
 12.64911+ \\
 1.12837 \\
 \hline
 8854377 \\
 3794733 \\
 10119288 \\
 2529822 \\
 1264911 \\
 1264911 \\
 \hline
 14.2728762504 \text{ Ans}
 \end{array}$$

2. What length of a halter will
be sufficient to fasten a horse from it require to lay the floor of a
a post in the centre so that he may be able to graze upon an acre of grass.
and no more: Ans. 4.1364 perches or
or 117 ft. 9 inches.

$$\begin{array}{r}
 160 (12.64911+ \\
 22 \overline{) 60} \\
 \underline{44} \\
 246 \overline{) 1600} \\
 \underline{1476} \\
 2524 \overline{) 12400} \\
 \underline{10096} \\
 25289 \overline{) 230400} \\
 \underline{227601} \\
 25298.1 \overline{) 249900} \\
 \underline{252981} \\
 252982.1 \overline{) 2691900} \\
 \underline{2529821}
 \end{array}$$

$$\begin{array}{r}
 12.64911+ \\
 1.12837 \\
 \hline
 8854377 \\
 3794733 \\
 10119288 \\
 2529822 \\
 1264911 \\
 1264911 \\
 \hline
 14.2728762504
 \end{array}$$

2 14.2728762504
7.1364. Ans Answer

Application

1. If an army of 20436 men is
formed into a square column;
how many men will each front
contain: Ans. 144 men.

$$\begin{array}{r}
 20436 (144 \text{ Ans.} \\
 24 \overline{) 107} \\
 \underline{96} \\
 284 \overline{) 1136} \\
 \underline{1136}
 \end{array}$$

2. How many feet of boards will
be sufficient to lay the floor of a
room that is 25 feet square:
Ans. 625 feet.

$$\begin{array}{r}
 25 \\
 25 \\
 \hline
 125 \\
 50 \\
 \hline
 625. \text{ Ans.}
 \end{array}$$

Square Root Examples

3. A certain square pavement contains 194136 square stones all of the same size; how many are contained in one of its sides: Ans. 441.

$$\begin{array}{r} 194136 \text{ (441 Ans.)} \\ 16 \\ 84 \overline{) 371} \\ \underline{336} \\ 3536 \\ 884 \overline{) 3536} \\ \underline{3536} \end{array}$$

6. What is the square root of 964,519,236,0241: Ans. 31,05641.

$$\begin{array}{r} 964,519,236,0241 \text{ (31,05641 Ans.)} \\ 9 \\ 61 \overline{) 64} \\ \underline{61} \\ 6205 \overline{) 35192} \\ \underline{31025} \\ 62106 \overline{) 416736} \\ \underline{372636} \\ 621124 \overline{) 4410002} \\ \underline{4317889} \\ 6211341 \overline{) 6211341} \\ \underline{6211341} \end{array}$$

4. In a triangular piece of ground containing 600 perches one of the shortest sides measures 40 perches and the other 30; what is the length of the longest side. Ans. 50 perches.

$$\begin{array}{r} 40 \\ 40 \\ \hline 1600 \end{array} \quad \begin{array}{r} 30 \\ 30 \\ \hline 900 \\ 1600 \\ \hline 2500 \text{ (50 Ans.)} \\ 25 \\ \hline 10 \overline{) 00} \end{array}$$

7. What is the square root of 1030892198,4001: Ans. 32104,51.

$$\begin{array}{r} 1030892198,4001 \text{ (32104,51 Ans.)} \\ 9 \\ 62 \overline{) 130} \\ \underline{124} \\ 641 \overline{) 689} \\ \underline{641} \\ 64204 \overline{) 482198} \\ \underline{449449} \\ 642145 \overline{) 3244940} \\ \underline{3210725} \\ 6421501 \overline{) 6421501} \\ \underline{6421501} \end{array}$$

5. Two gentlemen set out from pill slough at the same time: one of them travels 84 miles due north, and the other 50 miles due west: what distance are they asunder: Ans. 97 $\frac{3}{4}$ miles.

$$\begin{array}{r} 84 \\ 84 \\ \hline 396 \\ 672 \\ \hline 7056 \end{array} \quad \begin{array}{r} 50 \\ 50 \\ \hline 2500 \\ 4036 \\ \hline 9556 \text{ (97 $\frac{3}{4}$ Ans.)} \\ 21 \\ \hline 184 \overline{) 1456} \\ \underline{1309} \\ 1944 \overline{) 14700} \\ \underline{13629} \\ 19545 \overline{) 107100} \\ \underline{97725} \\ 9375 \end{array}$$

Last. S. H. D. W. S. L.

Cube Root

1. What is the cube root of 1182285111 (361. Ans.)

the greatest cube in 118 = 27
 square of 3 x 3 = 27.36
 add 540
 compl divisor 3 276
 2nd defect P. 3888.16
 add 4320
 2nd complet P. 393136

$$\begin{array}{r} 1182285111 \\ 27 \overline{) 1182285111} \\ \underline{19656} \\ 15725111 \\ \underline{15725111} \end{array}$$

$$\begin{array}{r} 36 \\ 3 \overline{) 36} \\ \underline{9} \\ 27 \end{array}$$

$$\begin{array}{r} 63 \\ 3 \overline{) 63} \\ \underline{18} \\ 30 \\ \underline{540} \end{array}$$

$$\begin{array}{r} 36 \\ 36 \\ 216 \\ 108 \\ \underline{1296} \\ 3 \\ 3888 \end{array}$$

2. What is the cube root of 138211. Ans. 21

138211 (21 Ans.)

$$\begin{array}{r} 138211 \\ 21 \overline{) 138211} \\ \underline{1216} \\ 1656 \\ \underline{1456} \\ 200 \end{array}$$

$$\begin{array}{r} 36 \\ 36 \\ 216 \\ 108 \\ \underline{1296} \\ 3 \\ 3888 \end{array}$$

3. What is the cube root of 3732118. Ans. 42

3732118 (42 Ans.)

$$\begin{array}{r} 3732118 \\ 42 \overline{) 3732118} \\ \underline{14704} \\ 12618 \\ \underline{12618} \end{array}$$

$$\begin{array}{r} 42 \\ 42 \\ 168 \\ 84 \\ \underline{343} \end{array}$$

$$\begin{array}{r} 42 \\ 42 \\ 168 \\ 84 \\ \underline{343} \end{array}$$

$$\begin{array}{r} 42 \\ 42 \\ 168 \\ 84 \\ \underline{343} \end{array}$$

Cube Root Cube R

4. What is the cube root of 5435339. Ans. 179.

$$\begin{array}{r}
 5435339 \text{ (179 Ans)} \\
 \underline{179} \\
 4735 \\
 \underline{3913} \\
 822339 \\
 \underline{822339} \\
 0 \\
 91371
 \end{array}$$

5. What is the cube root of 84604519. Ans. 439.

$$\begin{array}{r}
 84604519 \text{ (439 Ans)} \\
 \underline{439} \\
 20604 \\
 \underline{15504} \\
 5094519 \\
 \underline{5094519} \\
 0 \\
 566391
 \end{array}$$

5. What is the cube root of 84604519.

6. What is the cube root of 24054036008. Ans. 3002.

$$\begin{array}{r}
 24054036008 \text{ (3002 Ans)} \\
 \underline{3002} \\
 54036008 \\
 \underline{54036008} \\
 0 \\
 24018004
 \end{array}$$

7. What is the cube root of 122615324232. Ans. 4968.

$$\begin{array}{r}
 122615324232 \text{ (4968 Ans)} \\
 \underline{4968} \\
 58615 \\
 \underline{53649} \\
 4966324 \\
 \underline{4374936} \\
 591391232 \\
 \underline{591391232} \\
 0 \\
 43804864 \\
 \underline{119040} \\
 43923904
 \end{array}$$

Cube Root

8. What is the cube root of 22069810125. Ans. 2805

22069810125 (2805 Ans.)

$$\begin{array}{r}
 1264 \overline{) 14069} \\
 \underline{480} \\
 1744 \overline{) 117810125} \\
 \underline{23520025} \\
 42000 \\
 \underline{23562025}
 \end{array}$$

9. What is the cube root of 219365327491. Ans. 6031

219365327491 (6031 Ans.)

$$\begin{array}{r}
 216 \overline{) 3365327} \\
 \underline{3256227} \\
 109100791 \\
 \underline{109100791}
 \end{array}$$

10. What is the cube root of 673373097125. Ans. 8765

673373097125 (8765 Ans.)

$$\begin{array}{r}
 512 \overline{) 161373} \\
 \underline{20929} \\
 2270736 \overline{) 14870097} \\
 \underline{15660} \\
 2286396 \overline{) 13718376} \\
 \underline{230212825} \\
 131400 \\
 \underline{230314225}
 \end{array}$$

11. What is the cube root of 12.944875. Ans. 2.35

12.944875 (235 Ans.)

$$\begin{array}{r}
 1209 \overline{) 4977} \\
 \underline{120} \\
 1389 \overline{) 810875} \\
 \underline{158425} \\
 3450 \\
 \underline{162175}
 \end{array}$$

Cube Root James

mmmmmmmmmm
mmmmmmmmmm

12. What is the cube root of 15926.942504 Ans. 25.16 +

$$\begin{array}{r}
 15926.942504 (25.16 + \text{Ans.}) \\
 \underline{8} \\
 1225 \quad 7926 \\
 \underline{300} \quad 7625 \\
 1525 \quad 301942 \\
 \underline{184501} \quad 188251 \\
 450 \quad 113421504 \\
 \underline{188251} \quad 113673096 \\
 18900336 \quad 48408 \\
 \underline{45180} \\
 18945516
 \end{array}$$

13. What is the cube root of 36155.024576 Ans. 33.06 +

$$\begin{array}{r}
 36155.024576 (33.06 + \text{Ans.}) \\
 \underline{27} \\
 2709 \quad 9155 \\
 \underline{270} \quad 8937 \\
 2979 \quad 218027576 \\
 32670036 \quad 196376616 \\
 \underline{59400} \quad 21650960 \\
 32429436
 \end{array}$$

14. What is the cube root of 053258249. Ans. 376 +

$$\begin{array}{r}
 .053258249 (376 + \text{Ans.}) \\
 \underline{27} \\
 2749 \quad 26258 \\
 \underline{630} \quad 23653 \\
 3379 \quad 2605249 \\
 \underline{410736} \quad 2504876 \\
 6660 \quad 100903 \\
 414396
 \end{array}$$

15. What is the cube root of .001906624. Ans. 124

$$\begin{array}{r}
 .001906624 (124 \text{ Ans}) \\
 \underline{1} \\
 304 \quad 906 \\
 \underline{60} \quad 728 \\
 364 \quad 178624 \\
 \underline{43216} \quad 178624 \\
 1440 \\
 44656
 \end{array}$$

mmmmr Cube Root

16. What is the cube root of .000000429. Ans. .009

.000000429 (009 Ans.
 $\underline{729}$

17. What is the cube root of 2. Ans. 1.25 +

2 (1.25 Ans.

309		1000
60		438
369		262000
43225		225125
1800		36875
45025		

Cube Root

James W. McCormick

Cube Root Root

2. What is the cube root of $12\frac{19}{24}$: Ans. $2\frac{1}{3}$

$$\begin{array}{r} 12\frac{19}{24} \\ 24 \overline{) 288} \\ \underline{48} \\ 240 \\ \underline{240} \\ 0 \end{array}$$

$$\begin{array}{r} 343(7 \\ 343 \end{array}$$

$$\begin{array}{r} 24(3)7(2\frac{1}{3}) \text{ Ans.} \\ \underline{24} \quad \underline{6} \\ 0 \end{array}$$

2. What is the cube root of $405\frac{28}{125}$: Ans. $7\frac{2}{5}$

$$\begin{array}{r} 405\frac{28}{125} \\ 125 \overline{) 50653} \\ \underline{2033} \\ 812 \\ \underline{405} \\ 50653 \\ \underline{125} \end{array}$$

$$\begin{array}{r} 50653(37 \\ 24 \overline{) 23653} \\ \underline{2449} \\ 630 \\ \underline{630} \\ 0 \end{array}$$

$$\begin{array}{r} 125(5)37(7\frac{2}{5}) \text{ Ans.} \\ \underline{125} \quad \underline{35} \\ 2 \\ \underline{2} \\ 0 \end{array}$$

Surds

1. What is the cube root of $4\frac{1}{5}$: Ans. $1.93+$

$$\begin{array}{r} 5 \overline{) 1.0} \\ 4.200(1.93 \text{ Ans} \end{array}$$

$$\begin{array}{r} 381 \overline{) 6200} \\ \underline{270} \\ 651 \overline{) 341000} \\ \underline{110409} \\ 1710 \overline{) 334254} \\ \underline{112419} \end{array}$$

5. What is the cube root of $8\frac{5}{7}$: Ans. $2.054+$

$$\begin{array}{r} 7 \overline{) 5.00} \\ 8.714285714(2.054+ \text{ Ans} \end{array}$$

$$\begin{array}{r} 120025 \overline{) 714285} \\ \underline{3000} \\ 123025 \overline{) 99160714} \\ \underline{12604549} \\ 43050 \overline{) 10606521} \\ \underline{12650599} \end{array}$$

6. What is the cube root of $9\frac{1}{6}$: Ans. $2.092+$

$$\begin{array}{r} 6 \overline{) 1.00} \\ 9.166666666(2.092+ \text{ Ans.} \end{array}$$

$$\begin{array}{r} 120081 \overline{) 1166666} \\ \underline{5400} \\ 125481 \overline{) 34337666} \\ \underline{13104304} \\ 12540 \overline{) 26233688} \\ \underline{13116844} \end{array}$$

Cube Root Tables *Mormick*

Examples. SSS

1. If the solid content of a globe is 10648, what is the side of a cube of equal solidity. Ans. 22.

10648 (22 Ans.

$$\begin{array}{r} 1204 \overline{) 2648} \\ 120 \overline{) 2648} \\ \hline 1324 \end{array}$$

2. If the solid content of a globe is 389017, what is the side of a cube of equal solidity Ans. 73.

389017 (73 Ans

$$\begin{array}{r} 14709 \overline{) 46017} \\ 630 \overline{) 46017} \\ \hline 15339 \end{array}$$

Examples. SSS

1. There is a cubical vessel whose side is two feet; I demand the size of another vessel which shall contain three times as much. Ans. 2 feet 10 inches and $\frac{2}{3}$ nearly.

$$\begin{array}{r} \text{in} \\ 24 \\ 24 \\ \hline 96 \\ 48 \\ \hline 576 \\ 24 \\ \hline 2304 \\ 1152 \\ \hline 13824 \end{array} \quad \text{Inches}$$

$$\begin{array}{r} 41472 (31.6 \text{ ans} \\ 27 \\ \hline 2716 \overline{) 114472} \\ 360 \overline{) 114472} \\ \hline 3046 \overline{) 2168000} \\ 346836 \overline{) 2117436} \\ 6120 \overline{) 50264} \\ \hline 352956 \end{array}$$

$$\begin{array}{r} 12 \overline{) 31.6} \\ 2.10, \frac{2}{3} \text{ inches} \end{array}$$

2. There is a cubical vessel whose side is 1 foot, required the side of another vessel that shall contain three times as much. Ans. 17.306 inches.

$$\begin{array}{r} \text{in} \\ 12 \\ 12 \\ \hline 144 \\ 12 \\ \hline 1428 \\ 3 \\ \hline 5184 (17.306 \text{ in. ans} \\ 1 \\ \hline 349 \overline{) 4184} \\ 210 \overline{) 3913} \\ \hline 559 \overline{) 241000} \\ 86709 \overline{) 264417} \\ \hline 1530 \overline{) 6283000000} \\ 88239 \overline{) 5389088616} \\ \hline 897840036 \overline{) 893911384} \\ 311400 \overline{) 898181436} \end{array}$$

Cube Root

1. If a ball of 6 inches diameter weigh 32 lb. what will one of the same metal weigh, whose diameter is 3 inches. Ans. 4 lb.

Application.

$$\begin{array}{r} \text{in} \\ 6 \\ \hline 36 \\ 216 \end{array} : 32 :: \begin{array}{r} \text{in} \\ 3 \\ \hline 9 \\ 27 \\ 81 \end{array}$$

$$216 \overline{) 864} \text{ 4 lb. Ans.}$$

2. What is the side of a cubical mound equal to one 288 feet long, 216 broad, and 48 high. Ans. 144 feet.

$$\begin{array}{r} 288 \\ 216 \\ \hline 1728 \\ 288 \\ \hline 576 \\ 62208 \\ 48 \\ \hline 497664 \\ 248832 \\ \hline 2985984 \end{array} \quad \begin{array}{l} 144 \text{ feet} \\ \text{Ans.} \end{array}$$

$$\begin{array}{r} 316 \\ 120 \\ \hline 436 \\ 58816 \\ 1680 \\ \hline 60496 \end{array} \quad \begin{array}{l} 1985 \\ 1444 \\ \hline 2341984 \\ 2341984 \\ \hline \end{array}$$

3. There is a stone of a cubic form, which contains 389017 solid feet: what is the superficial content of one of its sides. Ans. 5329 feet.

$$\begin{array}{r} 389017 \\ 389017 \\ \hline 2423119 \\ 389017 \\ \hline 35011530 \\ 3112136 \\ \hline 1167051 \\ 151394226289 \end{array} \quad \begin{array}{l} 5329 \text{ feet} \\ \text{Ans.} \end{array}$$

$$\begin{array}{r} 7509 \\ 450 \\ \hline 4959 \\ 842404 \\ 3180 \\ \hline 845884 \\ 84907281 \\ 143640 \\ \hline 85050921 \end{array} \quad \begin{array}{l} 26334 \\ 23844 \\ \hline 2457226 \\ 1691768 \\ \hline 765458289 \\ 765458289 \\ \hline \end{array}$$

Cube Root D

4. What is the difference between half a solid foot, and a solid half foot. Ans. 3 half feet.

$$\begin{array}{r} 12 \\ 144 \\ 12 \\ 2 \overline{) 1728} \\ 864 \\ 216 \\ 216 \overline{) 648} (3 \text{ Ans.} \\ 648 \end{array}$$

$$\begin{array}{r} 6 \\ 36 \\ 6 \\ 216 \end{array}$$

5. In a cubical foot, how many cubes of 6 inches, and how many of 4 are contained therein. A. 8 of 6 inches, and 27 of 4 inches.

$$\begin{array}{r} 6 \\ 36 \\ 6 \\ 216 \end{array}$$

$$216 \overline{) 1728} (8 \text{ of 6 inches} \\ 1728$$

$$\begin{array}{r} 4 \\ 16 \\ 4 \\ 64 \end{array}$$

$$64 \overline{) 1728} (27 \text{ of 4 inches} \\ 128 \\ 448 \\ 448$$

2. What is the cube root of 13824. Ans. 24

$$13824 (24 \text{ Ans.}$$

$$\begin{array}{r} 1216 \overline{) 13824} \\ 240 \\ 1456 \end{array}$$

$$\begin{array}{r} 24 \\ 24 \\ 96 \\ 48 \\ 576 \\ 24 \\ 2304 \\ 1152 \\ 13824 \end{array}$$

Proof

Proof

Progression James McHermick

Case 1.

1. A merchant bought 50 yards of linen, at 2 cents for the first yard, 4 for the second, 6 for the third, &c. increasing two cents every yard, what was the price of the last yard, how much the whole amount, and what the average price per yard.

24 6 50 number of terms less one

$$\begin{array}{r}
 \text{Multiply } \frac{49}{2} \text{ common difference} \\
 \text{add } \frac{98}{2} \text{ first term} \\
 \hline
 100 \text{ last term} \\
 \frac{100}{2} \text{ sum of the two extremes} \\
 \hline
 50 \text{ number of terms} \\
 \hline
 2500 \text{ Sum of all the terms} \\
 \hline
 50 \text{ cents per yard}
 \end{array}$$

Ans { 100 cents the last yard
 25 50 do the whole amount
 50 do the average price per yard

2. Bought 20 yards of calico at 3 cents for the first yard, 6 for the second, 9 for the third, &c. what did the whole cost. Ans. 6 dolls. 30 cents.

$$\begin{array}{r}
 369 \quad 20 \\
 \frac{19}{1} \\
 \hline
 54 \\
 \text{add } \frac{3}{3} \text{ last} \\
 \hline
 60 \\
 \frac{6}{3} \\
 \hline
 63 \\
 \frac{20}{20} \\
 \hline
 2) 1260 \text{ Ans} \\
 \hline
 630
 \end{array}$$

Progression

3. If 100 apples were laid two yards distant from each other in a right line, and a basket placed two yards distant from the first apple, what distance must a person travel to gather them singly into the basket. Ans. 11 miles 3 furlongs 180 yards.

11 8 16

$$\begin{array}{r}
 100 \\
 \underline{1} \\
 99 \\
 \underline{1} \\
 396 \\
 \underline{1} \\
 1100 \\
 \underline{1} \\
 1101 \\
 \underline{100} \\
 2)110100 \\
 1760 \overline{)20200} \quad 11 \text{ miles} \\
 \underline{1760} \\
 2600 \\
 \underline{1760} \\
 840 \\
 220 \overline{)840} \quad 3 \text{ furlongs} \\
 \underline{660} \\
 180 \text{ yards}
 \end{array}$$

4. A agreed to serve B 10 years, at the rate of 20 dollars for the first year, 30 for the second, 40 for the third, &c. what had he the last year, how much for the whole time, and what per annum. Ans. 110 dolls. for the last year, 650 dolls. the whole amount, and 65 dolls. per annum.

$20 \quad 30 \quad 40$

$$\begin{array}{r}
 19 \\
 \underline{9} \\
 10 \\
 \underline{90} \\
 20 \\
 \underline{110} \text{ last} \\
 20 \text{ first term} \\
 \underline{130} \\
 10 \\
 2)1300 \\
 10 \overline{)650} \text{ Ans.} \\
 65 \text{ per annum.}
 \end{array}$$

5. A sold to B 1000 acres of land, at 10 cents for the first acre, 20 for the second, 30 for the third, &c.; what was the price of the last acre, and what did the whole come to

Ans. { 100 dolls. the last acre
50050 do. whole cost

$10 \quad 20 \quad 30$

$$\begin{array}{r}
 1000 \\
 \underline{999} \\
 10 \\
 \underline{9990} \\
 10 \\
 \underline{10000} \text{ last term} \\
 10 \\
 \underline{10010} \\
 1000 \\
 2)10010000 \\
 5005000
 \end{array}$$

Ans. { 100 dolls. the last acre
50050 do. whole cost.

Progression Progressio^N

III Case 2. III

1. A is to receive from B a certain sum to be paid in 11 several payments in arithmetical progression; the first payment to be 20 dollars, and the last to be 100 dollars; what is the common difference, what was each payment, and how much the whole debt

Operation. $\begin{array}{r} 100 \text{ last term} \\ 20 \text{ first term} \\ \hline 80 \text{ the difference} \end{array}$
 No. of terms $11 - 1 = 10$ $\overline{) 80}$
 8 common difference

$20 + 10 \times 8 = 100$ 20 first payment
 $20 + 8 = 28$ second do.
 $28 + 8 = 36$ third do. &c.

2. There are 21 persons whose ages are equally distant from each other, in arithmetical progression; the youngest is 20 years old, and the eldest 60; what is the common difference of their ages, and the age of each man;

$\begin{array}{r} 60 \\ 20 \\ \hline 40 \\ 21 - 1 = 20 \overline{) 40} \\ \hline 2 \text{ common difference} \end{array}$
 $20 + 60 \times 10 = 1200$ 20 first payment

Ans. $\begin{cases} 20 + 2 = 22 \text{ second do.} \\ 22 + 2 = 24 \text{ the third. \&c.} \end{cases}$

3. A man is to travel from Pittsburgh to a certain place in 12 days, and to go but 3 miles the first day, increasing each day's journey in arithmetical progression, making the last days travelling 58 miles; what is the daily increase, and what the whole distance.

$\begin{array}{r} 58 \\ 3 \\ \hline 55 \\ 12 - 1 = 11 \overline{) 55} \\ \hline 5 \text{ common difference} \end{array}$

Ans. $\begin{cases} 5 \text{ miles daily increase} \\ 366 \text{ miles whole distance.} \end{cases}$

$\begin{array}{r} 3 \\ 2 \overline{) 10} \\ \hline 5 \text{ miles daily increase} \end{array}$

$3 + 58 \times 6 = 366 \text{ miles whole distance}$

Geometrical Progression

Example. 111 1. Suppose 20 yards of broad cloth was sold at 4 mills for the first yard. 12 for the second. 36 for the third. &c. what did the cloth come to and what was gained by the sale, supposing the prime cost to have been 15 dollars per yard:

$$\begin{array}{r}
 \text{Indices } 1 \quad 2 \quad 3 \quad 4 \\
 \text{Ratio } 3 \quad 9 \quad 27 \quad 81 \\
 \hline
 81 \\
 81 \\
 648 \\
 6561 = \text{the 8th power} \\
 6561 \\
 39366 \\
 32805 \\
 39366 \\
 43046721 = 16\text{th power} \\
 27 = 3\text{d power} \\
 301327047 \\
 86093442 \\
 1162261467 = 19\text{th power} \\
 \times 4 \text{ first term} \\
 4649045868 = 20\text{th or last term} \\
 + 3 \text{ ratio} \\
 13947137604 \text{ first term} \\
 - 4 \text{ first term} \\
 \hline
 947137600 \\
 \text{Ratio } 3-1=2 \quad 13947137600 \\
 \text{dolls. } 6973568800 \text{ first cost of the cloth} \\
 30000 \\
 \hline
 6973268800 \text{ gain.}
 \end{array}$$

2. A father gave his daughter, who was married on the first day of January, one dollar towards her portion, promising to double it on the first day of every month for one year; what is the amount of her whole portion. Ans. 1095 dollars.

Geometrical Progression

$$\begin{array}{r}
 1 \quad 2 \quad 3 \quad 4 \quad 5 \\
 2 \quad 4 \quad 8 \quad 16 \quad 32 \\
 \hline
 32 \\
 64 \\
 \hline
 96 \\
 1024 \\
 \hline
 2048 \\
 \hline
 4096 \\
 \hline
 11095 \text{ Ans}
 \end{array}$$

3. A merchant sold 15 yards of satin; the first yard for 1s. the second for 2s. the third for 4s. &c. in geometrical progression; what was the price of the 15 yards. Ans. 1638l. 4s.

$$\begin{array}{r}
 1 \quad 2 \quad 3 \quad 4 \quad 5 \\
 2 \quad 4 \quad 8 \quad 16 \quad 32 \\
 \hline
 32 \\
 64 \\
 \hline
 96 \\
 1024 \\
 \hline
 16 \\
 6144 \\
 \hline
 1024 \\
 16384 \\
 \hline
 32768 \\
 \hline
 20)32768 \text{ Ans}
 \end{array}$$

11. A goldsmith sold 1 pound of gold at 1 cent for the first ounce. 16 for the second. 16 for the third. &c. what did it come to. and what did he gain. supposing he gave 20 dolls per ounce. Ans. he sold it for 55924 dollars 5 cents. and gained 55684 dolls 5 cents.

$$\begin{array}{r}
 1 \quad 2 \quad 3 \quad 4 \\
 16 \quad 64 \quad 256 \\
 \hline
 256 \\
 1536 \\
 1280 \\
 612 \\
 \hline
 65536 \\
 64 \\
 \hline
 262144 \\
 393216 \\
 \hline
 4194304 \\
 16777216 \\
 \hline
 16777216 \\
 16777216 \\
 \hline
 5592405 \\
 24000 \\
 \hline
 5568405
 \end{array}$$

Ans

Geometrical Progression

5. What sum would purchase a horse. with 11 shoes and 8 nails in each shoe. at 1 mill for the first nail. 2 mills for the second. 4 mills for the third. &c. doubling in geometrical progression to the last. Ans. 11291967 dolls. 29cts 5 mills.

1	2	3	4	5	6	7	8
2	4	8	16	32	64	128	256
							512
							1024
							2048
							4096
							8192
							16384
							32768
							65536
							131072
							262144
							524288
							1048576
							2097152
							4194304
							8388608
							16777216
							33554432
							67108864
							134217728
							268435456
							536870912
							1073741824
							2147483648
							4294967296
							8589934592
							17179869184
							34359738368
							68719476736
							137438953472
							274877906944
							549755813888
							1099511627776
							2199023255552
							4398046511104
							8796093022208
							17592186044416
							35184372088832
							70368744177664
							140737488355328
							281474976710656
							562949953421312
							1125899906842624
							2251799813685248
							4503599627370496
							9007199254740992
							18014398509481984
							36028797018963968
							72057594037927936
							144115188075855872
							288230376151711744
							576460752303423488
							1152921504606846976
							2305843009213693952
							4611686018427387904
							9223372036854775808
							18446744073709551616
							36893488147419103232
							73786976294838206464
							147573952589676412928
							295147905179352825856
							590295810358705651712
							1180591620717411303424
							2361183241434822606848
							4722366482869645213696
							9444732965739290427392
							18889465931478580854784
							37778931862957161709568
							75557863725914323419136
							151115727451828646838272
							302231454903657293676544
							604462909807314587353088
							1208925819614629174706176
							2417851639229258349412352
							4835703278458516698824704
							9671406556917033397649408
							19342813113834066795298816
							38685626227668133590597632
							77371252455336267181195264
							154742504910672534362390528
							309485009821345068724781056
							618970019642690137449562112
							1237940039285380274899124224
							2475880078570760549798248448
							4951760157141521099596496896
							9903520314283042199192993792
							19807040628566084398385987584
							39614081257132168796771975168
							79228162514264337593543950336
							158456325028528675187087900672
							316912650057057350374175801344
							633825300114114700748351602688
							1267650600228229401496703205376
							2535301200456458802993406410752
							5070602400912917605986812821504
							10141204801825835211973625643008
							20282409603651670423947251286016
							40564819207303340847894502572032
							81129638414606681695789005144064
							162259276829213363391578010288128
							324518553658426726783156020576256
							649037107316853453566312041152512
							1298074214633706907132624082305024
							2596148429267413814265248164610048
							5192296858534827628530496329220096
							10384593717069655257060992658440192
							20769187434139310514121985316880384
							41538374868278621028243970633760768
							83076749736557242056487941267521536
							166153499473114484112975882535043072
							332306998946228968225951765070086144
							664613997892457936451903530140172288
							1329227995784915872903807060280344576
							2658455991569831745807614120560689152
							5316911983139663491615228241121378304
							10633823966279326983230456482242756608
							21267647932558653966460912964485513216
							42535295865117307932921825928971026432
							85070591730234615865843651857942052864
							170141183460469231731687303715884105728
							340282366920938463463374607431768211456
							680564733841876926926749214863536422912
							1361129467683753853853498429727072845824
							2722258935367507707706996859454145691648
							5444517870735015415413993718908291383296
							10889035741470030830827987437816582766592
							21778071482940061661655974875633165533184
							43556142965880123323311949751266331066368
							87112285931760246646623899502532662132736
							174224571863520493293247799005065244265536
							348449143727040986586495598010130488531072
							696898287454081973172991196020260977062144
							1393796574908163946345982392040521954124288
							2787593149816327892691964784081043908248576
							5575186299632655785383929568162087816497152
							11150372599265311570767859136324175632994304
							22300745198530623141535718272648351265988608
							44601490397061246283071436545296702531977216
							89202980794122492566142873090593405063954432
							178405961588244985132285746181186810127908864
							356811923176489970264571492362373620255817728
							713623846352979940529142984724747240511635456
							1427247692705959881058285969449494481023270912
							2854495385411919762116571938898988962046541824
							5708990770823839524233143877797977924093083648
							11417981541647679048466287755595955848186167296
							22835963083295358096932575511191911696372334592
							45671926166590716193865151022383823392744669184
							91343852333181432387730302044767646785489338368
							182687704666362864775460604089535293570978676736
							365375409332725729550921208179070587141957353472
							730750818665451459101842416358141174283914706944
							1461501637330902918203684832716282348567829413888
							2923003274661805836407369665432564697135658827776
							5846006549323611672814739330865129394271317655552
							11692013098647223345629478661730258788542635311104
							23384026197294446691258957323460517577085270622208
							46768052394588893382517914646921035154170540244416
							93536104789177786765035829293842070308341080488832
							187072209578355573530071658587684140616682160977664
							374144419156711147060143317175368281233364321955328
							748288838313422294120286634350736562466728643910656
							1496577676626844588240573268701473124933457287821312
							2993155353253689176481146537402946249866914575642624
							5986310706507378352962293074805892499733829151285248
							11972621413014756705924586149611784999467658302570496
							23945242826029513411849172299223569998935316605140992
							47890485652059026823698344598447139997870633210281984
							95780971304118053647396689196894279995741266420563968
							191561942608236107294793378393788559991482532441127936
							383123885216472214589586756787577119982965064882255872
							766247770432944429179173513575154239965930129764511744
							1532495540865888858358347027150308479931860259529023488
							3064991081731777716716694054300616959637720519058046976
							6129982163463555433433388108601233919275441038116093952
							12259964326927110866866776217202467838550882076232187904
							24519928653854221733733552434404935677101764152464375808

Geometrical Progression

$$\begin{array}{r}
 4625597484987 \\
 \underline{81} \\
 4625597484987 \\
 61004779879896 \\
 \underline{617673396283947} \\
 18 \quad 5302018851841 \\
 \underline{3-1-2} \quad 18 \quad 530201888518410 \\
 92651009442592.0 \quad \text{Ans.}
 \end{array}$$

7. What sum would purchase the same horse, with the same number of shoes and nails, at 1 mill for the first nail, 16 for the second, 16 for the third, &c. in a quadruple ratio of geometrical progression to the last: Ans. 6148914691236517dolls. 20cts. 5 mls.

$$\begin{array}{r}
 1 \quad 2 \quad 3 \quad 4 \quad 5 \quad 6 \quad 7 \quad 8 \\
 16.64.256.1024.4096.16384.65536
 \end{array}$$

$$\begin{array}{r}
 65536 \\
 \underline{393216} \\
 196608 \\
 \underline{327680} \\
 327680 \\
 \underline{393216} \\
 429496 \quad 7296 \\
 \underline{4096} \\
 2576980 \quad 3776 \\
 \underline{3865470} \quad 5664 \\
 171798691 \quad 840 \\
 \underline{17 \quad 592186044416} \\
 1024 \\
 70368744177664 \\
 \underline{3512437208882} \\
 175921860444160 \\
 \underline{1801439850948} \quad 1984 \\
 256 \\
 108086391056891904 \\
 \underline{9007199254409920} \\
 36028797018963968 \\
 \underline{4611686018427387904} \\
 18446744073709551616 \\
 \underline{4-1-3} \quad 18446744073709551615 \\
 614891469123651720.5 \quad \text{Ans}
 \end{array}$$

Geometrical Progression

Q. Sold 30 yards of silk velvet. at 2 pence for the first yard. 6 for the second. 18 for the third. &c. and these disposed of at 1000 for a farthing; what did the velvet amount to; and what was gained by the sale. supposing the prime cost to have been 100l. per yard:

Ans. { Amount 214469929l. 5s. 3½d
Gained 214466929l. 5s. 3½d

1 2 3 4 5 6 7
3. 9. 27. 81. 243. 729. 2187
2187
15309
17496
2187
4374
4782969
4782969
43046721
28697814
43046721
9565938
38263752
33480783
19131876
22876792454961
3
68630377364883
2
37260454729766
3
411782264189298
2
3-1-2) 411782264189296
4) 205891132094648
12) 51472783023-2
20) 428939858(5=3
214469929-5=3½d
3000
214466929-5=3½d

Ans.

Position Position James

III Examples. III 1. A school master being asked how many scholars he had. said if I had as many. half as many. and one quarter as many more. I should have 132; how many had he:

Operation
Suppose he had 110

as many 110
 $\frac{1}{2}$ as many 20
 $\frac{1}{4}$ as many 10

as 110 : 110 :: 132 : 118 Ans.

proof 118
118
211
12
132

2. It is required to divide a certain sum of money among 4 persons. in such a manner that the first shall have $\frac{1}{3}$. the second $\frac{1}{4}$. the third $\frac{1}{6}$. and the fourth the remainder. which is 28 dolls; what was the sum.

Suppose 72

$\frac{1}{3}$ is 24
 $\frac{1}{4}$ is 18
 $\frac{1}{6}$ is 12
54

Error 18 : 72 :: 28 : 112 Ans. 112 dolls.

proof 112
 $\frac{1}{3}$ is 37 $\frac{1}{3}$
 $\frac{1}{4}$ is 28
 $\frac{1}{6}$ is 18 $\frac{2}{3}$

$\frac{81}{28}$ last share.

3. A. B. and C. buy a carriage for 340 dollars. of which A pays three times as much as B. and B four times as much as C; what did each pay. & A paid 240 dolls.

Ans. { B 80
C 20

5
20
60

85 : 5 :: 340

85 | 3400
1700
1700
0

20 C's

4 B's

3 A's

Ans.

Position Position

4. What is the sum of which $\frac{1}{4}$, $\frac{1}{5}$ and $\frac{1}{6}$ make 148 dollars:

Ans. 2110 dolls.

$$\begin{array}{r} 60 \\ \frac{1}{4} \text{ is } 15 \\ \frac{1}{5} \text{ is } 12 \\ \frac{1}{6} \text{ is } 10 \\ \hline 37 \end{array}$$

$$37 : 60 :: 148$$

$$\begin{array}{r} 60 \\ 37 \overline{) 8880} \text{ Ans. } 2110 \\ \underline{74} \\ 148 \\ \underline{148} \\ 0 \end{array}$$

5. A person having spent $\frac{1}{2}$ and $\frac{1}{3}$ of his money. had $26\frac{2}{3}$ dolls. left; what had he at first: Ans. 160 dolls.

$$\begin{array}{r} 36 \\ \frac{1}{2} \text{ is } 18 \\ \frac{1}{3} \text{ is } 12 \\ \hline 30 \end{array}$$

$$6 : 36 :: 26\frac{2}{3}$$

$$\begin{array}{r} 216 \\ 72 \\ \underline{24} \\ 6 \overline{) 960} \text{ Ans. } 160 \end{array}$$

$$\begin{array}{r} 36 \\ 3 \overline{) 72} \\ \underline{24} \end{array}$$

6. A. B. and C. talking of their ages. B said his age was once and a half the age of A: C said his was twice. and one-tenth the age of both. and that the sum of their ages was 93: what was the age of each:

$$\begin{array}{r} A \quad 20 \\ \frac{1}{2} \quad 10 \\ \hline B \quad 30 \\ \frac{1}{2} \quad 15 \\ \hline C \quad 50 \\ \frac{1}{10} \quad 5 \\ \hline 100 \\ \frac{1}{10} \quad 10 \\ \hline 110 \\ \frac{1}{10} \quad 11 \\ \hline 121 \end{array}$$

$$155 : 20 :: 93$$

$$\begin{array}{r} 20 \\ 155 \overline{) 2380} \text{ Ans } 12\frac{1}{2} \text{ Ans} \\ \underline{155} \\ 830 \\ \underline{810} \\ 20 \end{array}$$

$$\begin{array}{r} B \quad 18 \\ \frac{1}{2} \quad 9 \\ \hline C \quad 30 \\ \frac{1}{10} \quad 3 \\ \hline 33 \end{array} \text{ Ans}$$

$$\begin{array}{r} 60 \\ 3 \overline{) 180} \text{ Ans} \\ \underline{60} \\ 120 \\ \underline{120} \\ 0 \end{array}$$

Position

7. Seven-eighths of a certain number exceeds four-fifths by 6: what is that number: Ans. 80

$$\begin{array}{r} 16 \\ 8 \overline{) 112} \\ \underline{112} \\ 0 \end{array} \quad \begin{array}{r} 16 \\ 5 \overline{) 64} \\ \underline{64} \\ 0 \end{array}$$

$$1.2 : 16 :: 6$$

$$1.2 \overline{) 96} 80 \text{ Ans}$$

8. A gentleman bought a chaise, horse, and harness, for 360 dollars: the horse came to twice the price of the harness, and the chaise to twice the price of the horse and harness together: what did he give for each:

$$\begin{array}{r} 10 \\ 10 \\ \underline{20} \\ 10 \\ \underline{30} \\ 2 \\ \underline{60} \\ 20 \\ \underline{80} \\ 10 \\ \underline{90} \end{array} : 10 :: 360$$

$$90 \overline{) 3600} 40$$

Ans. { 80 dolls. for the horse
40 harness
240 Chaise

Harness 40 Horse 80
Chaise 240

9. A gentleman being asked the price of his carriage, answered, that $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{5}$, and $\frac{1}{6}$ of its price was 228 dollars: what was the price of the carriage: Ans. 240 dollars.

$$\begin{array}{r} 60 \\ \frac{1}{3} \text{ is } 20 \\ \frac{1}{4} \text{ is } 15 \\ \frac{1}{5} \text{ is } 12 \\ \frac{1}{6} \text{ is } 10 \\ \hline 54 : 60 :: 228 \end{array}$$

$$54 \overline{) 1368} 240 \text{ Ans}$$

10. A saves $\frac{1}{3}$ of his wages, but B who has the same salary, by spending twice as much as A, sinks 50 dollars a year: what is their annual salary: Ans. 150 dollars each

$$\begin{array}{r} 30 \\ \frac{1}{3} \text{ is } 10 : 30 :: 50 \\ \hline 10 \overline{) 1500} 150 \text{ Ans} \\ \underline{150} \\ 0 \end{array}$$

Double Position

1. A father leaves his estate to be divided among his three sons. A. B. and C. in the following manner. viz. A is to have one half wanting 50 dollars. B one third. and C 10 dolls. less than B: what was the sum left. and what was each son's share:

Operation.

1st. Suppose 240 dollars.

then $240 \div 2 - 50 = 70$ A's part

~~240~~ $240 \div 3 = 80$ B's part

B's share $80 - 10 = 70$ C's part

Sum of all the parts 20

20 ev. too little.

2d. Suppose 300 dollars.

~~then 300 dollars.~~

then $300 \div 2 - 50 = 100$ A's part

100 B's part

$300 \div 3 =$

90 C's part

B's share $100 - 10 =$

290

10 ev. too little.

errors

1st. sup. 240

$20 = 6000$

2d. sup. 300

$10 = 2400$

$10 \overline{) 3600} 360$ Ans.

proof $360 \div 2 - 50 = 130$

$\div 3 = 120$

$- 10 = 110$ Ans.

360

2. A and B have the same income; A saves the $\frac{1}{2}$ of his. but B by spending 30 dollars per annum more than A. at the end of 8 years finds himself 400 dollars in debt what is their income. and how much does each spend per annum:

Ans. { Their income is 200 dolls. per ann
A spends 175
B spends 205

$$\begin{array}{r} 30 \\ \times 8 \\ \hline 240 \end{array}$$

$$\begin{array}{r} 80 \\ 8 \overline{) 640} \\ \underline{80} \\ 560 \\ \underline{240} \\ 800 \\ \underline{160} \\ 40 \\ \underline{40} \\ 0 \end{array}$$

$$\begin{array}{r} 308 \\ \hline 240 \end{array}$$

2d Ep

1st Suppos.

2d Supposition 80
50
1400

$$\begin{array}{r} 120 \\ 150 \\ \hline 6000 \\ 120 \\ \hline 18000 \\ 14000 \\ \hline 32000 \end{array}$$

thier income

$$\begin{array}{r} A. \text{ expends} = \frac{175}{30} \\ B. \text{ expends} = \frac{205}{30} \end{array}$$

3. A. B. and C. would divide 100 dollars. between them. so as B may have 3 dollars more than A. and C 11 dolls more than B: how many dollars must each have: $\{ \begin{array}{l} A \text{ 30 dollars} \\ B \text{ 33 dollars} \\ C \text{ 37 dollars} \end{array}$

$$\begin{array}{r} 100 \\ \hline \text{sum } 0 \\ \hline 3 \\ \hline 13 \\ \hline 4 \\ \hline 17 \\ \hline 13 \\ \hline 10 \\ \hline 40 \\ 100 \\ \hline 60 \text{ exp} \\ 30 \\ \hline 30 \end{array}$$

$$\begin{array}{r}
 100 \\
 \hline
 \text{Exp } 20 \\
 3 \\
 \hline
 23 \\
 4 \\
 \hline
 27 \\
 23 \\
 20 \\
 \hline
 70 \\
 100 \\
 \hline
 30 \text{ env}
 \end{array}$$

ve: *SA* 30 dollars
Ans *B* 33
C 37

$$\begin{array}{r}
 10 \quad \diagup \quad 60 \\
 \quad \quad \quad \diagdown \quad 30 \\
 \quad \quad \quad \quad \quad 0 \\
 \hline
 300
 \end{array}$$

$$\begin{array}{r}
 20 \\
 \hline
 60 \\
 1200 \\
 \hline
 300 \\
 \hline
 3000
 \end{array}$$

$$\begin{array}{r}
 30000 \\
 \hline
 300 \\
 \hline
 300 \\
 \hline
 300 \\
 \hline
 300
 \end{array}$$

A J
 B J
 C J

Double Position

4. A. B. and C. built a house which cost 10000 dollars:
A paid a certain sum. B paid 1000 dollars more than A.
and C paid as much as both A and B: how much did each
one pay?

$$\begin{array}{r} 10000 \\ 10 \\ 1000 \\ 1010 \\ 10 \\ 1020 \\ 1020 \\ 2040 \end{array}$$

$$\begin{array}{r} 10000 \\ 2040 \\ 7960 \text{ err} \\ 7920 \\ 40 \end{array}$$

$$\begin{array}{r} 10000 \\ 20 \\ 1000 \\ 1020 \\ 20 \\ 1040 \\ 1040 \\ 2080 \end{array}$$

$$\begin{array}{r} 10000 \\ 2080 \\ 12080 \text{ errors.} \end{array}$$

$$\begin{array}{r} 10 \quad 4960 \\ 4960 \quad 20 \\ 159200 \\ 49200 \\ 40 \quad 80000 \\ 2000 \text{ A's} \\ 1000 \text{ B's} \\ 3000 \text{ C's} \\ 2000 \\ 5000 \end{array}$$

5. A gentleman has 2 horses. and a saddle worth 50
dollars. which saddle if he put on the back of the
first horse will make his value double that of the second
: but if he put it on the second horse. it will make his value
triple that of the first; what is the value of each horse:

$$\begin{array}{r} 20 \\ 30 \\ 50 \\ 100 \\ 60 \text{ err} \\ 25 \\ 50 \\ 75 \end{array}$$

$$\begin{array}{r} 20 \quad 25 \\ 25 \quad 50 \\ 1250 \\ 1000 \\ 75 \quad 2250 \text{ 30 horse} \\ 225 \quad 50 \\ 080 \\ 240 \text{ horse} \end{array}$$

$$\begin{array}{r} 20 \times 3 = 60 \\ 50 \times 3 = 150 \\ 20 \times 3 = 60 \\ 50 \times 3 = 150 \\ 20 \times 3 = 60 \\ 50 \times 3 = 150 \end{array}$$

$$\begin{array}{r} 20 \quad 25 \\ 25 \quad 50 \\ 1250 \\ 1000 \\ 75 \quad 2250 \text{ 30 horse} \\ 225 \quad 50 \\ 080 \\ 240 \text{ horse} \end{array}$$

Double Position

6. The head of a fish is 9 inches long. and its tail is as long as its head and half its body. and its body is as long as its head and tail together: what is its whole length *Ans. 6 feet.*

1st Suppose

12 body	2) 24
6 1/2 the head	12
9 the head	9
15 the tail	21
9 head	9
24	30
12	24
err 12	err 6
6	

12	12
24	6
12	12
288	72
72	
6) 216	
36	
18	
9	
12) 72	
6	

feet *Ans*

7. A laborer hired 40 days upon this condition. that he should receive 20 cents for every day he wrought. and forfeit 10 cents for every day he was idle: at settlement he received 5 dollars: how many days did he work. and how many was he idle: *Ans. wrought 30 days. idle 10.*

worked	40	worked	40
20	34	20	24
680	idle	480	16 idle
60	10	160	10
6.20	60	err 2.20	160
5		5	
err 1.20 +		1.80	
		1.20	
		3.00	

34	1.20	40	30 worked
24	180	34	10 idle
120	420	10	1.00 forfeit
480	540		
24	6120		
2880	2880		
300	9000		
	30 days		
	20		
	6.00		
	1.00		
	5.00 received		

Double Position

8. A and B vested equal sums in trade A gained a sum equal to $\frac{1}{4}$ of his stock; and B lost 225 dollars. then A's money was double that of B's: what sum had each vested:

Ans. 600 dolls.

$\begin{array}{r} 4 \overline{) 500} \\ 125 \\ \hline 625 \\ 550 \\ \hline \text{err } 75 \end{array}$	$\begin{array}{r} 500 \\ 225 \\ \hline 275 \\ 2 \\ \hline 550 \end{array}$	$\begin{array}{r} 4 \overline{) 800} \\ 200 \\ \hline 1000 \\ 575 \\ 2 \\ \hline 1150 \\ 1000 \\ \hline 150 \text{ err} \\ 75 \\ \hline 225 \end{array}$
--	--	--

$\begin{array}{r} 500 \\ 75 \\ \hline 800 \\ 60000 \\ 75000 \\ \hline 225 \overline{) 35000} \\ 1350 \\ \hline 00 \end{array}$	$\begin{array}{r} 45 \\ 150 \\ \hline 500 \\ 75000 \\ \hline 600 \text{ answer} \end{array}$
--	--

9. Divide 15 into two such parts. so that when the greater is multiplied by 11. and the less by 16. the products will be equal:
Ans. greater 12. less 3.

$\begin{array}{r} 10 \\ 4 \\ \hline 40 \end{array}$	$\begin{array}{r} 5 \\ 16 \\ \hline 80 \\ 40 \\ \hline \text{err } 40 \end{array}$	$\begin{array}{r} 9 \\ 4 \\ \hline 36 \end{array}$	$\begin{array}{r} 6 \\ 16 \\ \hline 96 \\ 36 \\ \hline \text{err } 60 \\ 40 \\ \hline 20 \end{array}$
---	--	--	---

$\begin{array}{r} 10 \\ 9 \\ \hline 40 \\ 360 \end{array}$	$\begin{array}{r} 110 \\ 600 \\ \hline 600 \\ 360 \\ \hline 20 \overline{) 240} \\ 12 \\ \hline 11 \\ 48 \end{array}$	$\begin{array}{r} 3 \\ 16 \\ \hline 48 \end{array} \text{ Ans.}$
--	---	--

10. A person being asked in the afternoon. what o'clock it was. answered that the time past from noon was equal to $\frac{2}{3}$ of the time to midnight: what o'clock was it

Ans. 36 minutes past 10 o'clock

$$\begin{array}{r}
 H \quad M \\
 3 \dots 00 \\
 1 \dots 23 \frac{1}{3} \\
 \hline
 60 \dots 36 \frac{12}{13} \\
 96 \\
 13 \\
 \hline
 290 \\
 97 \\
 \hline
 1260 \text{ err}
 \end{array}$$

$$\begin{array}{r}
 H \quad M \\
 5 \dots 00 \\
 1 \dots 20 \frac{11}{13} \\
 \hline
 3 \dots 55 \frac{5}{13} \\
 60 \\
 \hline
 235 \\
 13 \\
 \hline
 710 \\
 235 \\
 \hline
 3060 \text{ err} \\
 1260 \\
 \hline
 1800
 \end{array}$$

$$\begin{array}{r}
 3 \swarrow 1260 \\
 1260 \searrow \\
 \hline
 6300 \\
 3060 \\
 \hline
 9180 \\
 6300 \\
 \hline
 1800 \overline{) 28800} \\
 1800 \\
 \hline
 10800 \\
 60 \\
 \hline
 64800 (36 \\
 5400 \\
 \hline
 10800 \\
 10800
 \end{array}$$

Permutation James McHorn

III Examples. III

1. In how many different positions may 5 persons be placed at a table. $1 \times 2 \times 3 \times 4 \times 5 = 120$ Ans.
2. How many changes may be rung on 12 bells. and how long would they be ringing but once over. allowing 10 changes to be rung in one minute. and the year to contain 365 days and 6 hours: Ans. 479001600 changes. and would require 91 years 3 weeks. 5 days. and 6 hours.

$$\begin{array}{r}
 2 \\
 2 \\
 \hline
 3 \\
 3 \\
 \hline
 6 \\
 6 \\
 \hline
 12 \\
 12 \\
 \hline
 24 \\
 24 \\
 \hline
 48 \\
 48 \\
 \hline
 96 \\
 96 \\
 \hline
 192 \\
 192 \\
 \hline
 384 \\
 384 \\
 \hline
 768 \\
 768 \\
 \hline
 1536 \\
 1536 \\
 \hline
 3072 \\
 3072 \\
 \hline
 6144 \\
 6144 \\
 \hline
 12288 \\
 12288 \\
 \hline
 24576 \\
 24576 \\
 \hline
 49152 \\
 49152 \\
 \hline
 98304 \\
 98304 \\
 \hline
 196608 \\
 196608 \\
 \hline
 393216 \\
 393216 \\
 \hline
 786432 \\
 786432 \\
 \hline
 1572864 \\
 1572864 \\
 \hline
 3145728 \\
 3145728 \\
 \hline
 6291456 \\
 6291456 \\
 \hline
 12582912 \\
 12582912 \\
 \hline
 25165824 \\
 25165824 \\
 \hline
 50331648 \\
 50331648 \\
 \hline
 100663296 \\
 100663296 \\
 \hline
 201326592 \\
 201326592 \\
 \hline
 402653184 \\
 402653184 \\
 \hline
 805306368 \\
 805306368 \\
 \hline
 1610612736 \\
 1610612736 \\
 \hline
 3221225472 \\
 3221225472 \\
 \hline
 6442450944 \\
 6442450944 \\
 \hline
 12884901888 \\
 12884901888 \\
 \hline
 25769803776 \\
 25769803776 \\
 \hline
 51539607552 \\
 51539607552 \\
 \hline
 103079215104 \\
 103079215104 \\
 \hline
 206158430208 \\
 206158430208 \\
 \hline
 412316860416 \\
 412316860416 \\
 \hline
 824633720832 \\
 824633720832 \\
 \hline
 1649267441664 \\
 1649267441664 \\
 \hline
 3298534883328 \\
 3298534883328 \\
 \hline
 6597069766656 \\
 6597069766656 \\
 \hline
 13194139533312 \\
 13194139533312 \\
 \hline
 26388279066624 \\
 26388279066624 \\
 \hline
 52776558133248 \\
 52776558133248 \\
 \hline
 105553116266496 \\
 105553116266496 \\
 \hline
 211106232532992 \\
 211106232532992 \\
 \hline
 422212465065984 \\
 422212465065984 \\
 \hline
 844424930131968 \\
 844424930131968 \\
 \hline
 1688849860263936 \\
 1688849860263936 \\
 \hline
 3377699720527872 \\
 3377699720527872 \\
 \hline
 6755399441055744 \\
 6755399441055744 \\
 \hline
 13510798882111488 \\
 13510798882111488 \\
 \hline
 27021597764222976 \\
 27021597764222976 \\
 \hline
 54043195528445952 \\
 54043195528445952 \\
 \hline
 108086391056891904 \\
 108086391056891904 \\
 \hline
 216172782113783808 \\
 216172782113783808 \\
 \hline
 432345564227567616 \\
 432345564227567616 \\
 \hline
 864691128455135232 \\
 864691128455135232 \\
 \hline
 1729382256910270464 \\
 1729382256910270464 \\
 \hline
 3458764513820540928 \\
 3458764513820540928 \\
 \hline
 6917529027641081856 \\
 6917529027641081856 \\
 \hline
 13835058055282163712 \\
 13835058055282163712 \\
 \hline
 27670116110564327424 \\
 27670116110564327424 \\
 \hline
 55340232221128654848 \\
 55340232221128654848 \\
 \hline
 110680464442257309696 \\
 110680464442257309696 \\
 \hline
 221360928884514619392 \\
 221360928884514619392 \\
 \hline
 442721857769029238784 \\
 442721857769029238784 \\
 \hline
 885443715538058477568 \\
 885443715538058477568 \\
 \hline
 1770887431076116955136 \\
 1770887431076116955136 \\
 \hline
 3541774862152233910272 \\
 3541774862152233910272 \\
 \hline
 7083549724304467820544 \\
 7083549724304467820544 \\
 \hline
 14167099448608935641088 \\
 14167099448608935641088 \\
 \hline
 28334198897217871282176 \\
 28334198897217871282176 \\
 \hline
 56668397794435742564352 \\
 56668397794435742564352 \\
 \hline
 113336795588871485128704 \\
 113336795588871485128704 \\
 \hline
 226673591177742970257408 \\
 226673591177742970257408 \\
 \hline
 453347182355485940514816 \\
 453347182355485940514816 \\
 \hline
 906694364710971881029632 \\
 906694364710971881029632 \\
 \hline
 1813388729421943762059264 \\
 1813388729421943762059264 \\
 \hline
 3626777458843887524118528 \\
 3626777458843887524118528 \\
 \hline
 7253554917687775048237056 \\
 7253554917687775048237056 \\
 \hline
 14507109835375550096474112 \\
 14507109835375550096474112 \\
 \hline
 29014219670751100192948224 \\
 29014219670751100192948224 \\
 \hline
 58028439341502200385896448 \\
 58028439341502200385896448 \\
 \hline
 116056878683004400771792896 \\
 116056878683004400771792896 \\
 \hline
 232113757366008801543585792 \\
 232113757366008801543585792 \\
 \hline
 464227514732017603087171584 \\
 464227514732017603087171584 \\
 \hline
 928455029464035206174343168 \\
 928455029464035206174343168 \\
 \hline
 1856910058928070412348686336 \\
 1856910058928070412348686336 \\
 \hline
 3713820117856140824697372672 \\
 3713820117856140824697372672 \\
 \hline
 7427640235712281649394745344 \\
 7427640235712281649394745344 \\
 \hline
 14855280471424563298789490688 \\
 14855280471424563298789490688 \\
 \hline
 29710560942849126597578981376 \\
 29710560942849126597578981376 \\
 \hline
 59421121885698253195157962752 \\
 59421121885698253195157962752 \\
 \hline
 118842243771396506390315925504 \\
 118842243771396506390315925504 \\
 \hline
 237684487542793012780631851008 \\
 237684487542793012780631851008 \\
 \hline
 475368975085586025561263702016 \\
 475368975085586025561263702016 \\
 \hline
 950737950171172051122527404032 \\
 950737950171172051122527404032 \\
 \hline
 1901475900342344102245054808064 \\
 1901475900342344102245054808064 \\
 \hline
 3802951800684688204490109616128 \\
 3802951800684688204490109616128 \\
 \hline
 7605903601369376408980219232256 \\
 7605903601369376408980219232256 \\
 \hline
 15211807202738752817960438464512 \\
 15211807202738752817960438464512 \\
 \hline
 30423614405477505635920876929024 \\
 30423614405477505635920876929024 \\
 \hline
 60847228810955011271841753858048 \\
 60847228810955011271841753858048 \\
 \hline
 121694457621910022543683507716096 \\
 121694457621910022543683507716096 \\
 \hline
 243388915243820045087367015432192 \\
 243388915243820045087367015432192 \\
 \hline
 486777830487640090174734030864384 \\
 486777830487640090174734030864384 \\
 \hline
 973555660975280180349468061728768 \\
 973555660975280180349468061728768 \\
 \hline
 1947111321950560360698936123457536 \\
 1947111321950560360698936123457536 \\
 \hline
 3894222643901120721397872246915072 \\
 3894222643901120721397872246915072 \\
 \hline
 7788445287802241442795744493830144 \\
 7788445287802241442795744493830144 \\
 \hline
 15576890575604482885591488987660288 \\
 15576890575604482885591488987660288 \\
 \hline
 31153781151208965771182977975320576 \\
 31153781151208965771182977975320576 \\
 \hline
 62307562302417931542365955950641152 \\
 62307562302417931542365955950641152 \\
 \hline
 124615124604835863084731911901282304 \\
 124615124604835863084731911901282304 \\
 \hline
 249230249209671726169463823802564608 \\
 249230249209671726169463823802564608 \\
 \hline
 498460498419343452338927647605129216 \\
 498460498419343452338927647605129216 \\
 \hline
 996920996838686904677855295210258432 \\
 996920996838686904677855295210258432 \\
 \hline
 1993841993677373809355710590420516864 \\
 1993841993677373809355710590420516864 \\
 \hline
 3987683987354747618711421180841033728 \\
 3987683987354747618711421180841033728 \\
 \hline
 7975367974709495237422842361682067456 \\
 7975367974709495237422842361682067456 \\
 \hline
 15950735949418990474845684723364134912 \\
 15950735949418990474845684723364134912 \\
 \hline
 31901471898837980949691369446728269824 \\
 31901471898837980949691369446728269824 \\
 \hline
 63802943797675961899382738893456539648 \\
 63802943797675961899382738893456539648 \\
 \hline
 127605887595351923798765477786913079296 \\
 127605887595351923798765477786913079296 \\
 \hline
 255211775190703847597530955573826158592 \\
 255211775190703847597530955573826158592 \\
 \hline
 510423550381407695195061911147652317184 \\
 510423550381407695195061911147652317184 \\
 \hline
 1020847100762815390390123822295304634368 \\
 1020847100762815390390123822295304634368 \\
 \hline
 2041694201525630780780247644590609268736 \\
 2041694201525630780780247644590609268736 \\
 \hline
 4083388403051261561560495289181218537472 \\
 4083388403051261561560495289181218537472 \\
 \hline
 8166776806102523123120990578362437074944 \\
 8166776806102523123120990578362437074944 \\
 \hline
 16333553612205046246241981156724874149888 \\
 16333553612205046246241981156724874149888 \\
 \hline
 32667107224410092492483962313449748299776 \\
 32667107224410092492483962313449748299776 \\
 \hline
 65334214448820184984967924626899496599552 \\
 65334214448820184984967924626899496599552 \\
 \hline
 130668428897640369969935849253798993199104 \\
 130668428897640369969935849253798993199104 \\
 \hline
 261336857795280739939871698507597986398208 \\
 261336857795280739939871698507597986398208 \\
 \hline
 522673715590561479879743397015195972796416 \\
 522673715590561479879743397015195972796416 \\
 \hline
 1045347431181122959759486794030391945592832 \\
 1045347431181122959759486794030391945592832 \\
 \hline
 2090694862362245919518973588060783891185664 \\
 2090694862362245919518973588060783891185664 \\
 \hline
 4181389724724491839037947176121567782371328 \\
 4181389724724491839037947176121567782371328 \\
 \hline
 8362779449448983678075894352243135564742656 \\
 8362779449448983678075894352243135564742656 \\
 \hline
 16725558898897967356151788704486271129485312 \\
 16725558898897967356151788704486271129485312 \\
 \hline
 33451117797795934712303577408972542258970624 \\
 33451117797795934712303577408972542258970624 \\
 \hline
 66902235595591869424607154817945084517941248 \\
 66902235595591869424607154817945084517941248 \\
 \hline
 133804471191183738849214309635890169035882496 \\
 133804471191183738849214309635890169035882496 \\
 \hline
 267608942382367477698428619271780338071764992 \\
 267608942382367477698428619271780338071764992 \\
 \hline
 535217884764734955396857238543560676143529984 \\
 535217884764734955396857238543560676143529984 \\
 \hline
 1070435769529469910793714477087121352287059968 \\
 1070435769529469910793714477087121352287059968 \\
 \hline
 2140871539058939821587428954174242704574119936 \\
 2140871539058939821587428954174242704574119936 \\
 \hline
 4281743078117879643174857908348485409148239872 \\
 4281743078117879643174857908348485409148239872 \\
 \hline
 8563486156235759286349715816696970818296479744 \\
 8563486156235759286349715816696970818296479744 \\
 \hline
 17126972312471518572699431633393941636592959488 \\
 17126972312471518572699431633393941636592959488 \\
 \hline
 34253944624943037145398863266787883273185918976 \\
 34253944624943037145398863266787883273185918976 \\
 \hline
 68507889249886074290797726533575766546371837952 \\
 68507889249886074290797726533575766546371837952 \\
 \hline
 137015778499772148581595453067151533092743675904 \\
 137015778499772148581595453067151533092743675904 \\
 \hline
 274031556999544297163190906134303066185487351808 \\
 274031556999544297163190906134303066185487351808 \\
 \hline
 548063113999088594326381812268606132370974703616 \\
 548063113999088594326381812268606132370974703616 \\
 \hline
 1096126227998177188652763624537212264741949407232 \\
 1096126227998177188652763624537212264741949407232 \\
 \hline
 2192252455996354377305527249074424529483898814464 \\
 2192252455996354377305527249074424529483898814464 \\
 \hline
 4384504911992708754611054498148849058967797628928 \\
 4384504911992708754611054498148849058967797628928 \\
 \hline
 8769009823985417509222108996297698117935595257856 \\
 8769009823985417509222108996297698117935595257856 \\
 \hline
 17538019647970835018444217992595396235871190515712 \\
 17538019647970835018444217992595396235871190515712 \\
 \hline
 35076039295941670036888435985190792471742381031424 \\
 35076039295941670036888435985190792471742381031424 \\
 \hline
 70152078591883340073776871970381584943484762062848 \\
 70152078591883340073776871970381584943484762062848 \\
 \hline
 140304157183766680147553743940763169886969524125696 \\
 140304157183766680147553743940763169886969524125696 \\
 \hline
 280608314367533360295107487881526339773939048251392 \\
 280608314367533360295107487881526339773939048251392 \\
 \hline
 561216628735066720590214975763052679547878096502784 \\
 561216628735066720590214975763052679547878096502784 \\
 \hline
 1122433257470133441180429951526105359095756193005568 \\
 1122433257470133441180429951526105359095756193005568 \\
 \hline
 2244866514940266882360859903052210718191512386011136 \\
 2244866514940266882360859903052210718191512386011136 \\
 \hline
 4489733029880533764721719806104421436383024772022272 \\
 4489733029880533764721719806104421436383024772022272 \\
 \hline
 8979466059761067529443439612208842872766049544044544 \\
 8979466059761067529443439612208842872766049544044544 \\
 \hline
 17958932119522135058886879224417685745532099088089088 \\
 17958932119522135058886879224417685745532099088089088 \\
 \hline
 35917864239044270117773758448835371491064198176178176 \\
 35917864239044270117773758448835371491064198176178176 \\
 \hline
 71835728478088540235547516897670742982128396352356352 \\
 71835728478088540235547516897670742982128396352356352 \\
 \hline
 143671456956177080471095033795341485964256792704712704 \\
 143671456956177080471095033795341485964256792704712704 \\
 \hline
 287342913912354160942190067590682971928513585409425408 \\
 287342913912354160942190067590682971928513585409425408 \\
 \hline
 57468582782470832188$$

Permutation

James McCormick

$$\begin{array}{r}
 362880 \\
 10 \\
 \hline
 3628800 \\
 11 \\
 \hline
 39976800 \\
 12 \\
 \hline
 10)479001600 \\
 60)47900160 \\
 \hline
 79833691 \text{ Years} \\
 79894 \\
 \hline
 9396 \\
 2766 \\
 \hline
 \frac{1}{4} 630 \text{ one fourth of a day} \\
 365\frac{1}{4} \\
 \hline
 3150 \\
 3780 \\
 1990 \\
 154.5 \text{ 7} \\
 \hline
 230104.5 \text{ 26} \\
 175320 \text{ 3.516} \\
 \hline
 547875 \text{ wd 36} \\
 525960 \\
 \hline
 21915 \\
 24 \\
 \hline
 87660 \\
 43830 \\
 \hline
 525960 \\
 525960
 \end{array}$$

3. Seven men not agreeing with the owner of a boarding house about the price of boarding offer to give 100 dollars each. for as long time as they can seat themselves every day differently at dinner: this offer being accepted. how long may they stay: Ans. 5040 days. or 13 years. 295 days.

$$\begin{array}{r}
 \frac{1}{2} \\
 \frac{3}{2} \\
 \frac{4}{2} \\
 \frac{24}{2} \\
 \frac{5}{2} \\
 \frac{120}{2} \\
 \frac{720}{2} \\
 365)5040 \text{ 13 Years} \\
 365 \\
 \hline
 1390 \\
 1095 \\
 \hline
 295 \text{ days}
 \end{array}$$

11. What number of variations will the nine digits admit of: Ans. 362880.

$$\begin{array}{r}
 \frac{1}{2} \\
 \frac{2}{2} \\
 \frac{3}{2} \\
 \frac{6}{2} \\
 \frac{24}{2} \\
 \frac{5}{2} \\
 \frac{120}{2} \\
 \frac{6}{2} \\
 720 \\
 \hline
 5040 \\
 40320 \\
 \hline
 362880 \text{ Ans}
 \end{array}$$

~~Combination~~

Combination B

Examples

1. How many combinations may be made of 4 dollars out of 12:

$$\begin{array}{r} 1 \\ 2 \\ 3 \\ 6 \\ 11 \\ 24 \\ 5 \\ 120 \\ 6 \\ 720 \\ 7 \\ \hline 5040 \end{array}$$

$$\begin{array}{r} 12 \\ 11 \\ \hline 12 \\ 12 \\ \hline 132 \\ 10 \\ \hline 1320 \\ 9 \\ \hline 11880 \\ 8 \\ \hline 95040 \\ 7 \\ \hline 665280 \end{array}$$

$$\begin{array}{r} 5040 \overline{) 3991680} \quad 792 \text{ Ans.} \\ \underline{35280} \\ 46368 \\ \underline{45360} \\ 10080 \\ \underline{10080} \end{array}$$

A decorative horizontal line of calligraphic flourishes in brown ink on aged paper. The design consists of a series of overlapping, swirling loops and curves, creating a continuous, flowing pattern. The ink is a muted brown, and the paper shows signs of age, including slight discoloration and small dark spots. The overall effect is elegant and artistic, typical of 18th or 19th-century bookbinding decoration.

Contestations.

11. 2. 1845

1. Your many contributions will be made of value
and of use.

[illegible]

1800

152
153
154
155
156
157
158
159
160
161
162
163
164
165
166
167
168
169
170
171
172
173
174
175
176
177
178
179
180
181
182
183
184
185
186
187
188
189
190
191
192
193
194
195
196
197
198
199
200

20 NO
17

16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1

Decimals

Examples

ft.	in	'''	''''
25	9	3	5
34	3	9	2
28	10	4	8
64	11	9	4
82	4	5	6
15	8	7	9
44	6	11	2
22	3	6	1

3188 9 8 4

ft.	in	'''	''''
244	6	3	10
355	9	8	5
559	10	9	5
129	5	5	6
895	110	5	11
651	1	7	5
555	9	8	5
388	1110	10	9

32112 9 4 79

30610 3 0 94

32112 9 4 79

Subtraction of Decimals

Rule

ft.	in	'''	''''
From 125	4	3	2
Take 68	9	2	10

Rem. 56 7 0 10 1 Ans.

ft.	in	'''	''''
2456	5	7	8
1839	9	5	11
916	8	18	2
2456	5	7	8

3. From a board measuring 35 feet 9 inches 2 seconds. cut 24 feet 10 inches 5 seconds. and 11 thirds; what is left.

Ans. 10 ft 10 in. 8 sec. 8 th.

ft	in	'''	''''
35	9	2	0
24	10	5	11
10	10	8	8

Ans.

11. A Joiner having lined several rooms very ~~carefully~~ curiously with costly materials. finds the amount to be. in square measure 803 feet 3 inches 4 seconds. but several deductions being to be made for windows. arches. &c. those deductions amounted to 70 feet 3 inches. 4 seconds. 10 thirds. 5 fourths: how many feet of workmanship must he be paid for.

Ans. 732 ft. 11 in. 8''' 1'''' 4.

ft	in	'''	''''
803	3	4	0
70	3	4	10
732	11	8	1

Ans.

Multiplication of Decimals

Case 1.

1. Multiply 8.6.9 by 7.3

$$\begin{array}{r} \text{ft} \quad \text{in} \quad \text{''} \\ 8 \quad 6 \quad 9 \\ \times 7 \quad 3 \\ \hline 59 \quad 11 \quad 3 \\ 2 \quad 1 \quad 8 \quad 3 \\ \hline 62 \quad 0 \quad 11 \quad 3 \quad \text{Ans.} \end{array}$$

$$\begin{array}{r} 12 \overline{) 3} \\ 4 \quad 2 \quad 5 \\ \hline 12 \overline{) 6.45} \\ 8.5625 \\ 7.25 \\ \hline 128125 \\ 141250 \\ \hline 599375 \\ \text{proof } 62.078125 \\ \hline 0.937500 \\ \hline 11.250000 \\ \hline 3.000000 \end{array}$$

2. Multiply 9.5 by 3.11 Ans. 36.10.7

$$\begin{array}{r} \text{ft} \quad \text{in} \\ 9 \quad 5 \\ \times 3 \quad 11 \\ \hline 8 \quad 14 \quad 5 \\ 28 \quad 3 \\ \hline 36 \quad 10 \quad 7 \quad \text{Ans.} \end{array}$$

3. Multiply 4.10 by 8.11 Ans. 36.10.7

$$\begin{array}{r} \text{ft} \quad \text{in} \\ 4 \quad 10 \\ \times 8 \quad 11 \\ \hline 4 \quad 2 \quad 2 \\ 62 \quad 8 \\ \hline 69 \quad 10 \quad 2 \quad \text{Ans.} \end{array}$$

4. Multiply 8.11.6 by 2.7.11 Ans. 21.10.5

$$\begin{array}{r} \text{ft} \quad \text{in} \quad \text{''} \\ 8 \quad 11 \quad 6 \\ \times 2 \quad 7 \quad 11 \\ \hline 2 \quad 9 \quad 6 \quad 0 \\ 11 \quad 10 \quad 4 \quad 6 \\ \hline 16 \quad 9 \quad 0 \\ \hline 21 \quad 10 \quad 5 \quad 0 \quad \text{Ans.} \end{array}$$

5. What is the price of a marble slab whose length is 5 feet 7 inches and breadth 1 foot 10 inches and ~~cost~~ at 1 dollar and 50 cents per foot

Ans. 15 dolls. 31 1/2 cts

$$\begin{array}{r} \text{ft} \quad \text{in} \quad \text{''} \\ 5 \quad 7 \quad 10 \\ \times 1 \quad 10 \\ \hline 4 \quad 7 \quad 10 \\ 5 \quad 7 \\ \hline 12 : 1.50 :: 10 \quad 2 \quad 10 \\ \hline 12 \quad 122 \quad 12 \\ \hline 1111 \quad 1174 \quad 150 \\ \hline 73700 \\ \hline 1111 \quad 1174 \\ \hline 1111 \quad 221100 \quad (15.35 \text{ ans.}) \\ \hline 1111 \\ \hline 741 \\ 720 \\ \hline 510 \\ 1122 \\ \hline 780 \\ 720 \\ \hline 12 \overline{) 60} \quad (5) \\ \hline 1111 \quad (12) \end{array}$$

Multiplication of Decimals

6. There is a house with three tiers of windows. 3 in a tier. the height of the first tier is 7 feet 10 inches. of the second 6 feet 8 inches. and of the third 5 feet 11 inches. and the breadth of each window is 3 feet 11 inches: what will the glazing come to at 12 cents per foot. Ans. 32 dolls. 62½ cts.

$$\begin{array}{r} \text{ft} \quad \text{in} \\ 7 \quad 10 \\ 6 \quad 8 \\ 5 \quad 11 \\ \hline 18 \quad 29 \end{array}$$

$$\begin{array}{r} \text{ft} \quad \text{in} \\ 18 \quad 29 \\ 3 \quad 11 \\ \hline 54 \quad 40 \end{array}$$

$$\begin{array}{r} \text{ft} \quad \text{in} \\ 54 \quad 40 \\ 3 \quad 11 \\ \hline 162 \quad 51 \end{array}$$

$$\begin{array}{r} \text{ft} \quad \text{in} \\ 162 \quad 51 \\ 3 \quad 11 \\ \hline 486 \quad 153 \end{array}$$

$$\begin{array}{r} \text{ft} \quad \text{in} \\ 486 \quad 153 \\ 3 \quad 11 \\ \hline 1458 \quad 459 \end{array}$$

$$\begin{array}{r} \text{ft} \quad \text{in} \\ 1458 \quad 459 \\ 3 \quad 11 \\ \hline 4374 \quad 1377 \end{array}$$

$$\begin{array}{r} \text{ft} \quad \text{in} \\ 4374 \quad 1377 \\ 3 \quad 11 \\ \hline 13122 \quad 4131 \end{array}$$

Case 2

1. Multiply 84 feet 6 inches by 36 feet 4 inches and 6 seconds.

$$\begin{array}{r} 84 \text{ ft} \quad 6 \text{ in} \\ 36 \text{ ft} \quad 4 \text{ in} \quad 6 \text{ sec} \\ \hline 3012 \text{ ft} \quad 0 \text{ in} \quad 0 \text{ sec} \\ 336 \text{ ft} \quad 0 \text{ in} \quad 0 \text{ sec} \\ 21 \text{ ft} \quad 0 \text{ in} \quad 0 \text{ sec} \\ \hline 3091 \text{ ft} \quad 9 \text{ in} \quad 9 \text{ sec} \end{array}$$

2 multiply 46 ft 7 in by 19 ft 10 in Ans. 1518 ft 10 in 10

$$\begin{array}{r} 46 \text{ ft} \quad 7 \text{ in} \\ 19 \text{ ft} \quad 10 \text{ in} \\ \hline 872 \text{ ft} \quad 0 \text{ in} \quad 0 \text{ sec} \\ 82 \text{ ft} \quad 0 \text{ in} \quad 0 \text{ sec} \\ 46 \text{ ft} \quad 0 \text{ in} \quad 0 \text{ sec} \\ \hline 872 \text{ ft} \quad 0 \text{ in} \quad 0 \text{ sec} \end{array}$$

$$\begin{array}{r} 46 \text{ ft} \quad 7 \text{ in} \\ 19 \text{ ft} \quad 10 \text{ in} \\ \hline 872 \text{ ft} \quad 0 \text{ in} \quad 0 \text{ sec} \\ 82 \text{ ft} \quad 0 \text{ in} \quad 0 \text{ sec} \\ 46 \text{ ft} \quad 0 \text{ in} \quad 0 \text{ sec} \\ \hline 872 \text{ ft} \quad 0 \text{ in} \quad 0 \text{ sec} \end{array}$$

$$\begin{array}{r} 46 \text{ ft} \quad 7 \text{ in} \\ 19 \text{ ft} \quad 10 \text{ in} \\ \hline 872 \text{ ft} \quad 0 \text{ in} \quad 0 \text{ sec} \\ 82 \text{ ft} \quad 0 \text{ in} \quad 0 \text{ sec} \\ 46 \text{ ft} \quad 0 \text{ in} \quad 0 \text{ sec} \\ \hline 872 \text{ ft} \quad 0 \text{ in} \quad 0 \text{ sec} \end{array}$$

$$\begin{array}{r} 46 \text{ ft} \quad 7 \text{ in} \\ 19 \text{ ft} \quad 10 \text{ in} \\ \hline 872 \text{ ft} \quad 0 \text{ in} \quad 0 \text{ sec} \\ 82 \text{ ft} \quad 0 \text{ in} \quad 0 \text{ sec} \\ 46 \text{ ft} \quad 0 \text{ in} \quad 0 \text{ sec} \\ \hline 872 \text{ ft} \quad 0 \text{ in} \quad 0 \text{ sec} \end{array}$$

$$\begin{array}{r} 46 \text{ ft} \quad 7 \text{ in} \\ 19 \text{ ft} \quad 10 \text{ in} \\ \hline 872 \text{ ft} \quad 0 \text{ in} \quad 0 \text{ sec} \\ 82 \text{ ft} \quad 0 \text{ in} \quad 0 \text{ sec} \\ 46 \text{ ft} \quad 0 \text{ in} \quad 0 \text{ sec} \\ \hline 872 \text{ ft} \quad 0 \text{ in} \quad 0 \text{ sec} \end{array}$$

$$\begin{array}{r} 46 \text{ ft} \quad 7 \text{ in} \\ 19 \text{ ft} \quad 10 \text{ in} \\ \hline 872 \text{ ft} \quad 0 \text{ in} \quad 0 \text{ sec} \\ 82 \text{ ft} \quad 0 \text{ in} \quad 0 \text{ sec} \\ 46 \text{ ft} \quad 0 \text{ in} \quad 0 \text{ sec} \\ \hline 872 \text{ ft} \quad 0 \text{ in} \quad 0 \text{ sec} \end{array}$$

$$\begin{array}{r} 46 \text{ ft} \quad 7 \text{ in} \\ 19 \text{ ft} \quad 10 \text{ in} \\ \hline 872 \text{ ft} \quad 0 \text{ in} \quad 0 \text{ sec} \\ 82 \text{ ft} \quad 0 \text{ in} \quad 0 \text{ sec} \\ 46 \text{ ft} \quad 0 \text{ in} \quad 0 \text{ sec} \\ \hline 872 \text{ ft} \quad 0 \text{ in} \quad 0 \text{ sec} \end{array}$$

Multiplication of Duodecimals.

5. multiply $\begin{matrix} \text{ft in sec.} \\ 311 \text{ } 11 \text{ } 7 \end{matrix}$ by $\begin{matrix} \text{ft in sec.} \\ 36 \text{ } 4 \text{ } 5 \end{matrix}$

$$\begin{array}{r} 6 \times 6 = 36 \\ 1868.3.6 \\ 6 \end{array}$$

$$\begin{array}{r} 6 \text{ in. } \frac{1}{2} | 11209.9.0 \text{ } 111 \\ 153.8.3.6 \\ \hline 23.9.8.4 \text{ } 1111 \\ 8.4.2.10.11 \\ \hline 219.8.7 \\ 11402 \text{ } 0 \text{ } 0 \text{ } 4 \text{ } 11 \end{array} \text{ Ans}$$

6. A floor is 70 feet 8 inches by 38 feet 11 inches; how many square feet are therein: Ans. 275 ft. 11 in. 4 sec.

$$\begin{array}{r} \text{ft in} \\ 70 \text{ } 8 \end{array} \quad 6 \times 6 = 36$$

$$\begin{array}{r} 1124 \text{ } 0 \\ 2544 \text{ } 0 \\ \hline 1111 \text{ } 11 \\ 6 \text{ in. } \frac{1}{2} | 22685 \text{ } 11 \\ 11 \text{ in. } \frac{1}{3} | 35 \text{ } 11 \\ 1 \text{ } \frac{1}{4} | 23 \text{ } 6 \text{ } 8 \\ 11 \text{ in. } \frac{1}{4} | 510 \text{ } 8 \\ \hline 2750.1.11 \end{array} \text{ Ans.}$$

7. If a ceiling be 59 feet 9 inches long and 24 feet 6 inches broad. how many yards does it contain:

Ans. 162 yds. 5 ft 10 1/2 in

$$\begin{array}{r} \text{ft in} \\ 59 \text{ } 9 \end{array} \quad 6 \times 4 = 24$$

$$\begin{array}{r} 358 \text{ } 6 \\ 1434 \text{ } 0 \\ \hline 2910 \text{ } 6 \\ 146310 \text{ } 6 \\ \hline 162 \text{ yds } 5 \text{ ft } 10 \frac{1}{2} \text{ in} \end{array} \text{ Ans}$$

8. What will the paving of a court yard come to at 15 cents per yard. the length being 58 feet 6 inches. and the breadth 54 feet 9 inches

Ans. 530 doll. 38 + cts.

$$\begin{array}{r} \text{ft in} \\ 58 \text{ } 6 \end{array} \quad 6 \times 6 = 36$$

$$\begin{array}{r} 3159 \text{ } 0 \\ 29 \text{ } 3 \\ \hline 11 \text{ } 4 \text{ } 6 \\ 923202 \text{ } 10 \text{ } 6 \\ \hline 355 \text{ } 7 \text{ } 10 \frac{1}{2} \end{array}$$

$$\begin{array}{r} \text{ft in} \\ 58 \text{ } 6 \end{array} \quad 9 \times 6 = 54$$

$$\begin{array}{r} 526 \text{ } 6 \\ 6 \\ \hline 6 \\ 3159 \text{ } 0 \\ 29 \text{ } 3 \\ \hline 11 \text{ } 4 \text{ } 6 \\ 923202 \text{ } 10 \text{ } 6 \\ \hline 355 \text{ } 7 \text{ } 10 \frac{1}{2} \end{array}$$

Yards $\begin{matrix} \text{yards ft in} \\ 15 : : 355 \text{ } 7 \text{ } 10 \frac{1}{2} \end{matrix}$

$$\begin{array}{r} 4 \\ \hline 92 \\ 108 \\ \hline 216 \end{array}$$

$$\begin{array}{r} 3202 \\ 12 \\ \hline 3843 \text{ } 11 \\ 7686 \text{ } 8 \\ \hline 15 \\ 384340 \\ 76868 \\ \hline 216) 1153020 \text{ } 0 \text{ } (53.38 + \text{cts} \\ 1080 \\ \hline 730 \\ 648 \\ \hline 822 \\ 648 \\ \hline 1740 \\ 1728 \\ \hline 12 \end{array}$$

9. What is the solid content of a bale of goods. measuring in length 4 feet 6 inches. bre adth 3 feet 3 inches. and depth 1 foot 10 inches. Ans. 111 ft 8 in. 3 sec.

Multiplication of Duodecimals.

$$\begin{array}{r}
 \text{ft in} \\
 17 \dots 6 \\
 \underline{3 \dots 3} \\
 22 \quad 6 \\
 1 \quad 10 \quad 6 \\
 \underline{24 \quad 4 \quad 6} \\
 \quad 1 \dots 10 \\
 24 \quad 4 \quad 6 \\
 20 \quad 3 \quad 9 \quad 0 \\
 \hline
 11 \quad 4 \dots 8 \dots 3 \dots 0 \text{ Ans.}
 \end{array}$$

10. A merchant imports from London six bales of the following dimensions. viz What are the solid contents and how much will the freight amount to. at 20 dollars per ton of 40 feet.
 Ans. 41 ft. 7 in. and freight 35 dolls. 49 cts.

$$\begin{array}{r}
 2 \dots 10 \quad 2 \dots 11 \\
 0 \quad 11 \quad 4 \\
 5 \quad 8 \\
 \hline
 6 \quad 7 \quad 4 \dots 9 \\
 11 \quad 11 \quad 6 \quad 0 \\
 6 \quad 7 \quad 11 \\
 \hline
 11 \quad 6 \quad 10 \quad 0
 \end{array}$$

$$\begin{array}{r}
 2 \dots 10 \quad 2 \dots 6 \\
 1 \quad 5 \quad 0 \\
 5 \quad 8 \\
 \hline
 7 \quad 1 \quad 0 \\
 \quad 1 \dots 3 \\
 1 \quad 9 \quad 3 \quad 0 \\
 7 \quad 1 \quad 0 \\
 \hline
 8 \quad 10 \quad 3 \quad 0
 \end{array}$$

$$\begin{array}{r}
 3 \dots 6 \quad 2 \dots 2 \\
 8 \quad 7 \quad 0 \\
 7 \quad 0 \\
 \hline
 7 \quad 7 \quad 9 \dots 8 \\
 5 \quad 0 \quad 8 \quad 0 \\
 7 \quad 7 \quad 0 \\
 \hline
 12 \quad 7 \quad 8 \quad 0
 \end{array}$$

$$\begin{array}{r}
 2 \dots 10 \quad 2 \dots 8 \\
 1 \quad 10 \quad 8 \\
 5 \quad 8 \\
 \hline
 7 \quad 6 \quad 8 \dots 9 \\
 5 \quad 8 \quad 0 \quad 0 \\
 7 \quad 6 \quad 8 \\
 \hline
 13 \quad 2 \quad 8 \quad 0
 \end{array}$$

$$\begin{array}{r}
 2 \dots 10 \quad 2 \dots 6 \\
 1 \quad 5 \quad 0 \\
 5 \quad 8 \\
 \hline
 7 \quad 1 \quad 0 \\
 \quad 1 \dots 9 \\
 5 \quad 3 \quad 9 \quad 0 \\
 7 \quad 1 \quad 0 \\
 \hline
 12 \quad 4 \quad 9 \quad 0
 \end{array}$$

$$\begin{array}{r}
 2 \dots 11 \quad 2 \dots 8 \\
 1 \quad 11 \quad 8 \\
 5 \quad 10 \quad 8 \\
 \hline
 7 \quad 9 \quad 4 \dots 8 \\
 5 \quad 2 \quad 2 \quad 8 \\
 7 \quad 9 \quad 11 \\
 \hline
 12 \dots 11 \dots 6 \dots 8 \text{ --- } 6 \\
 12 \dots 11 \dots 9 \dots 0 \text{ --- } 5 \\
 13 \dots 2 \dots 8 \dots 0 \text{ --- } 11 \\
 12 \dots 7 \dots 8 \dots 0 \text{ --- } 3 \\
 8 \dots 10 \dots 3 \dots 0 \text{ --- } 2 \\
 11 \dots 6 \dots 10 \text{ --- } 1
 \end{array}$$

$$\begin{array}{r}
 40 : 20 :: 71 \dots 7 \dots 8 \dots 8 \\
 \underline{12} \\
 480 \quad 859 \quad 20 \\
 480 \overline{) 17180} \quad 35.79 \text{ Ans.} \\
 \underline{1440} \\
 2780 \\
 \underline{2400} \\
 3800 \\
 \underline{3360} \\
 4400 \\
 \underline{4320} \\
 80 \\
 8 \overline{) 80} = 10 \\
 48 \overline{) 0} = 6
 \end{array}$$

Multiplication of Duodecimals.

Examples.

1. The length of a single decked vessel is 60 feet. The breadth 20. and depth 10; what is the tonnage.

$$\begin{array}{r}
 60 \\
 \times 20 \\
 \hline
 1200 \\
 95 \overline{) 12000} \quad 126 \frac{6}{19} \text{ tons Ans} \\
 \underline{95} \\
 250 \\
 \underline{190} \\
 600 \\
 \underline{540} \\
 5 \overline{) 60} = 6 \\
 \underline{5} \quad 95 = 19
 \end{array}$$

2. Required the tonnage of a double decked vessel whose length is 90. and breadth 30.

$$\begin{array}{r}
 90 \\
 \times 30 \\
 \hline
 2700 \\
 15 \\
 \hline
 13500 \\
 2700 \\
 \hline
 40500 \\
 95 \overline{) 40500} \quad 426 \frac{6}{19} \text{ tons Ans.} \\
 \underline{380} \\
 250 \\
 \underline{190} \\
 600 \\
 \underline{540} \\
 5 \overline{) 60} = 6 \\
 \underline{5} \quad 95 = 19
 \end{array}$$

3. A single decked vessel is 64 feet long. 22 feet broad. and 10 feet deep; what is its tonnage.

Ans. 148 $\frac{14}{19}$ tons.

$$\begin{array}{r}
 64 \\
 \times 22 \\
 \hline
 128 \\
 1280 \\
 \hline
 14080 \\
 95 \overline{) 14080} \quad 148 \frac{14}{19} \text{ tonage Ans.} \\
 \underline{95} \\
 458 \\
 \underline{380} \\
 780 \\
 \underline{760} \\
 20 = 11 \\
 \underline{5} \quad 95 = 19
 \end{array}$$

4. What will be the tonnage of a double decked vessel whose length is 80 feet. and breadth 26 feet. A. 28 $\frac{12}{19}$ tons.

$$\begin{array}{r}
 80 \\
 \times 26 \\
 \hline
 480 \\
 1600 \\
 \hline
 2080 \\
 12 \\
 \hline
 6240 \\
 2080 \\
 \hline
 27040 \\
 95 \overline{) 27040} \quad 28 \frac{12}{19} \text{ tons Ans.} \\
 \underline{190} \\
 804 \\
 \underline{760} \\
 440 \\
 \underline{380} \\
 60 = 12 \\
 \underline{5} \quad 95 = 19
 \end{array}$$

Carpenter's or Sliding Rule

Measuring of Boards and Timber

SSS Examples SSS

1. Required to find a fourth proportional to 12, 28. and 114
Set the first term 12 on B. to the second term 28. on A. then against the third term 114 on B. Stan stands 266 on A. which is the fourth proportional sought.

$$\begin{array}{r} 12:28::114 \\ \hline 28 \\ 912 \\ \hline 228 \\ 12 \overline{) 3192} \quad 266 \text{ Ans.} \\ \underline{24} \\ 792 \\ \underline{72} \\ 72 \end{array}$$

2. Required the fourth proportional term to the numbers 25:
75::100. Ans. 300.

$$\begin{array}{r} 25:75::100 \\ \hline 100 \\ 25 \overline{) 7500} \quad 300 \text{ Ans.} \\ \underline{75} \\ 00 \end{array}$$

3. Required the fourth proportional term to the numbers 24:20::73

$$\begin{array}{r} 24:20::73 \text{ Ans. } 54\frac{2}{24} \\ \hline 20 \\ 24 \overline{) 1460} \quad 54\frac{2}{24} \\ \underline{135} \\ 110 \\ \underline{108} \\ 2 \\ \underline{24} \end{array}$$

SS Examples SS

1. Required the square root of 100.
Set 1 upon C to 10 upon D: then against the number 100 on C stands its root 10 on D.

2. Required the square root of 529. Ans. 23.

$$\begin{array}{r} 529(23 \text{ Ans.} \\ \hline 11 \\ 1129 \\ \hline 113 \overline{) 129} \\ \underline{1129} \end{array}$$

3. What is the square root of 900 Ans. 30

$$\begin{array}{r} 900(30 \text{ Ans} \\ \hline 6 \overline{) 500} \end{array}$$

4. What is the square root of 300. Ans. 17.3+

$$\begin{array}{r} 300(17.3+ \text{Ans.} \\ \hline 24 \overline{) 200} \\ \underline{189} \\ 300 \overline{) 1100} \\ \underline{1029} \\ 71 \end{array}$$

Measuring of Boards and Timber

Section. 3.

1. How many feet are there in a board that is 13 feet long and 16 inches broad:

By Duodecimals. Decimals.

Operation.

ft in
13.0
1.4

13 0
11 0
17 10 Ans.

13.
133
39
39
13
17.29 Ans.

2. Required the superficies of a board whose mean breadth is 1 foot 2 inches and length 12 feet 6 inches:

Ans. 3 dolls. 9½ cts
Ans. 14 feet 4 inches.

ft in
12.6
1.2
2 1 0
12 6
14 7 0 Ans.

3. Required the value of 5 oaken planks at 3 cents per foot; each of them being 17½ feet long and their several breadths as following viz. two of 13½ inches in the middle one of 14½ inches in the middle and the two remaining ones each 18 inches at the broader end and 11 inches at the narrower.

Ans. 3 dolls. 9½ cts

in
13½
13½
14½
41½
in
18
18
36
22½
258½
29½
41½
70.9"

in
11¼
11¼
22½

40.9"
4x11=44

283 0
113 0 0
7 0 9

6 in ½ | 120 0.9
ft 6 | 35.4
1:3::123 6.1.6
12
12
148 3 3
12
1480 0 2
1428) 5340 0 6 (309 Ans.
5184
156 0 6
155 5 2
54) 54 = 1
1728 = 32

Examples.

1. How many inches in length will it require to make one foot of a board that is 9 inches broad. Operation. 12:9=16 inches the length required.

2. How many inches in length of a board that is 23 inches wide will make 1 foot: Ans. 6.26+ inches

23)144(6.26+ Ans.
138
60
116
140
138
2

Measuring of Boards and Timber.

3. From a mahogany plank 26 inches broad, a yard and a half (or 13 feet 6 inches) is required to be cut off: what distance from the end must the line be struck. Ans. 41.7692 inches, or 6.23 feet

$$\begin{array}{r} 13 \dots 6 \\ 12 \\ 26 \overline{) 162} \quad (6.23 \text{ Ans.} \\ \underline{156} \\ 60 \\ \underline{52} \\ 80 \\ \underline{78} \\ 2 \end{array}$$

2. The quarter girt of a piece of squared timber is 15 inches, and the length 18 feet: required the solidity. Ans. 28½ feet.

$$\begin{array}{r} \text{in} \\ 15 \\ 15 \\ \hline 45 \\ 15 \\ \hline 225 \\ 18 \\ \hline 1800 \\ 225 \\ \hline 11050 \quad (28\frac{1}{2} \text{ feet Ans.} \\ 288 \\ \hline 1170 \\ 1152 \\ \hline 18 \overline{) 18} = 1 \\ 18 \overline{) 144} = 8 \end{array}$$

3. If a piece of squared timber be 15 inches square at the greater end, and 9 inches square at the lesser end, and the length be 20 feet: what is the solid content. Ans. 10.13 feet.

$$\begin{array}{r} \text{in} \\ 25 \\ 2 \overline{) 34} \\ \underline{14} \\ 289 \\ 20 \\ \hline 144 \overline{) 5780} \quad (10.13 \text{ Ans.} \\ \underline{546} \\ 200 \\ \underline{144} \\ 560 \\ \underline{432} \\ 128 \text{ Remainder} \end{array}$$

Examples

1. If a piece of timber be 2 feet 9 inches deep, and 1 foot 4 inches broad, and the length 16 feet 9 inches. (or the solid content. Ans. 10.13 feet. which is the same thing, if the quarter girt be 26 inches and the length 16 feet 9 inches) how many solid feet are contained therein:

Operation.

26 inches quarter girt 16.45 = 16 feet 9 inches

$$\begin{array}{r} 676 \text{ the length} \\ 10050 \\ 11425 \\ \hline 10050 \\ 144 \overline{) 1323.00} \quad (78.63 + \text{feet} \\ \underline{1008} \\ 1213 \\ \underline{1152} \\ 910 \\ \underline{864} \\ 460 \\ \underline{432} \\ 28 \text{ Rem} \end{array}$$

4. Suppose a piece of squared timber to measure 32 by 20 inches at the greater end, and 10 by 6 inches at the less, and the length 18 feet: how many feet of timber are contained therein. Ans. 34.12 + feet

Measuring of Boards and Timber

$$\begin{array}{r}
 2)32 \\
 \underline{16} \\
 16 \\
 2)16 \\
 \underline{8} \\
 8 \\
 2)8 \\
 \underline{4} \\
 4 \\
 2)4 \\
 \underline{2} \\
 2 \\
 2)2 \\
 \underline{1} \\
 1
 \end{array}$$

$2)10 \mid 2)20 \quad 2)6$
 $\underline{5} \quad \underline{10} \quad \underline{3}$
 $5 \quad 10 \quad 3$

$144)49 \quad 1 \quad 4 \quad 34.12 + \text{feet Ans.}$
 $\underline{43} \quad 2$
 $59 \quad 4$
 $\underline{54} \quad 6$
 180
 $\underline{144}$
 360
 $\underline{288}$
 62

$$\begin{array}{r}
 14 \\
 2 \\
 2)16 \\
 \underline{11} \quad 8 \\
 2 \\
 2 \\
 11 \\
 211 \\
 \underline{16} \\
 86 \text{ feet Ans.}
 \end{array}$$

Examples

1. A piece of round timber being 9 feet 6 inches long and its mean quarter girt 42 inches: what is the content

Decimals. 2.5×42
 Duodecimals. $3 \text{ ft } 6 \text{ in} = 42 \text{ inches.}$

$$\begin{array}{r}
 36 \\
 \underline{190} \\
 106 \\
 \underline{1230} \\
 96 \\
 \underline{616} \\
 1103 \\
 \underline{11646} \text{ Ans}
 \end{array}$$

3. If a piece of round timber is 18 feet long. measure 96 inches in circumference. or the quarter girt 24 inches; how many feet of timber does it contain: Ans. 42 feet.

$$\begin{array}{r}
 4)96 \\
 \underline{24} \\
 24 \\
 96 \\
 \underline{48} \\
 576 \\
 \underline{18} \\
 4608 \\
 \underline{546} \\
 144)10368 \quad 72 \text{ feet Ans.} \\
 \underline{1008} \\
 288 \\
 \underline{288}
 \end{array}$$

4. If a piece of round timber measure 11 feet 4 inches at the large end. 2 feet 8 inches at the less. and its length 21 feet. how many feet of timber are contained therein. Ans. 64.31 feet

$$\begin{array}{r}
 \text{ft} \quad \text{in} \\
 11 \quad 4 \\
 2 \quad 8 \\
 \underline{14} \quad 0 \\
 2)168 \\
 \underline{11} \quad 4 \\
 21 \\
 \underline{21} \\
 142 \\
 \underline{141} \\
 11 \\
 1441 \\
 \underline{141} \\
 1441 \\
 \underline{1441} \\
 882 \\
 144)9261 \quad 64.31 \text{ feet Ans.} \\
 \underline{864} \\
 621 \\
 \underline{546} \\
 450 \\
 \underline{432} \quad 180 \\
 180 \\
 \underline{180} \\
 36
 \end{array}$$

2. The length of a tree is 24 feet. its girt at the thicker end is 14 feet. and at the smaller end 2 feet: what is its content Ans. 96 feet.

5. Required the amount of three pieces of round timber measuring as follows. viz.

The first 24 feet long and mean girt 8 feet

the second 14½ do

do 3.15

the third 17½ do

do 6.28

Ans. 114.5 feet.

$$\begin{array}{r} 178 \\ 2 \\ \hline 2 \\ 11 \end{array}$$

$$\begin{array}{r} 24 \\ 11 \\ \hline 96 \end{array}$$

$$\begin{array}{r} 4)6.28 \\ 1.57 \\ 1.57 \\ \hline 10.99 \\ 7.85 \\ \hline 15.7 \end{array}$$

$$\begin{array}{r} 4)3.15 \\ 7875 \\ 5484 \\ \hline 55125 \\ 6300 \\ 551 \\ 39 \\ \hline 62015 \\ 14.5 \end{array}$$

$$\begin{array}{r} 123245 \\ 49298 \\ \hline 172543 \\ 24649 \\ \hline 42519525 \end{array}$$

$$\begin{array}{r} 310075 \\ 248060 \\ 62015 \\ \hline 8.992175 \\ 42.519525 \\ 96. \\ \hline 114.501700 \end{array}$$

Carpenters and Joiners Work.

III Examples. III

1. If a floor be 54 feet 3 inches long and 28 feet 6 inches broad. how many squares of flooring does it contain

By decimals.

ft in

54 3 = 54.25

28 6 = 28.5

28625

45800

11450

$$\begin{array}{r} 100)1631.625 \\ \hline 16.31.625 \text{ Ans} \end{array}$$

2. Let a floor be 53 feet 6 inches long and 14 feet 9 inches broad. how many squares does it contain

Ans. 25 squares. 54 feet

$$\begin{array}{r} 53.5 \\ 49.75 \\ \hline 2675 \\ 3745 \\ \hline 2140 \\ 100)2554.625 \text{ Ans.} \end{array}$$

Carpenters and Joiners Work

3. A floor being 36 feet 3 inches long and 16 feet 6 inches broad. what will it cost at 11 dollars and 50 cents per square. Ans. 26 dolls. 91 cts.

$$\begin{array}{r}
 \text{ft} \\
 36.25 \\
 16.5 \\
 \hline
 18125 \\
 21750 \\
 3625 \\
 \hline
 598.125 \\
 1650 \\
 \hline
 29906250 \\
 2392500 \\
 \hline
 100 \overline{) 2691.56250} \text{ Ans.}
 \end{array}$$

4. A room is 35 feet long and 30 feet wide; there is in it a fire place which measures 6 feet by 11 feet 6 inches and a well hole for the stairs measures 10 feet 6 inches by 8 feet; what will the flooring come to at 3 dolls. and 45 cents per square

Ans. 35 dolls. 21 cts.

$$\begin{array}{r}
 \text{ft} \\
 35 \\
 30 \\
 \hline
 1050 \\
 1050 \\
 111 \\
 \hline
 939 \\
 375 \\
 \hline
 4695 \\
 6573 \\
 \hline
 2817 \\
 100 \overline{) 3521.25} \text{ Ans.}
 \end{array}$$

5. How many squares are contained in a partition that is 32 feet 6 inches long and 12 feet 3 inches high
Ans. 10 squares and 10 feet.

$$\begin{array}{r}
 \text{ft} \\
 32.5 \\
 12.25 \\
 \hline
 4125 \\
 1650 \\
 \hline
 1650 \\
 825 \\
 \hline
 1010.625 \text{ Ans.}
 \end{array}$$

6. If a partition between rooms be in length 91 feet 9 inches and its height 11 feet 3 inches; how many squares are contained in it and how much does it come to at 11 dollars and 50 cents per square. Ans. 10 squares 32 feet and costs 116 dolls. 11 cts.

$$\begin{array}{r}
 \text{ft} \\
 91.75 \\
 11.25 \\
 \hline
 45875 \\
 18350 \\
 \hline
 9175 \\
 9175 \\
 \hline
 1032.1875 \\
 1650 \\
 \hline
 516093750 \\
 11287500 \\
 \hline
 10644.843750 \text{ Ans}
 \end{array}$$

7. If a house within the walls be 111 feet 6 inches long and 18 feet 3 inches broad: how many squares of roofing will it contain allowing the roof to be the true pitch
Operation

Carpenters and Joiners Work

By Decimals.

ft 18.25 = 18 3 the breadth
 11.5 = 11 6 the length
 9125
 7300
 flat 7300
 half 812.125
 half 406.62
 ÷ 100 1218.187
 sum 2.18 + Ans.

ft
 110.5
 20.5
 2025
 8100
 2583025
 415125
 1245375
 225 Squares
 6226875
 2490650
 2490750
 28.02.08 3 75 Ans.

8. What cost the roofing of a house at 1 dollar and 40 cents per square are: the length within the walls being 52 feet 8 inches. and the breadth 30 feet 6 inches; the roof being of a true pitch. Ans. 33⁰⁰ dolls. 73 cts.

ft
 52.67
 305
 26335
 158010
 251606.1135
 803217
 2409652
 140
 96386080
 2409652
 33.735 1.280 Ans.

9. Suppose a house measures with in the walls. 40 feet 6 inches in length. and 20 feet 6 inches in breadth. and the roof being a true pitch: how many squares of roofing does it contain. and how much will it cost at 2 dolls. 25 cents per square: Ans. 12.16375 squares. and costs 28 dolls. 2 + cts.

10. If a room or wainscot. being 126 feet 3 inches in compass: how many yards does that room contain. Operation.

By Decimals.
 126.25
 1575
 63125
 88375
 63125
 12625
 951988.11375
 220.8 Ans. 220 yards 8 feet

11. If a room of wainscot be 16 feet 3 inches high. and the compass of the room 137 feet 6 inches: how many yards are contained in it.

Ans. 248 yards 2 + feet.
 16.25
 137.5
 8125
 11375
 4875
 1625
 92234.375
 248.2 + Ans.

Carpenters and Joiners Work

12. If the window Shutters about a room be 69 feet 9 inches broad. and 6 feet 3 inches high ~~a room be~~: how many yards are contained therein. at work and half. Ans. 72.656 yards.

$$\begin{array}{r}
 \text{ft} \\
 69.75 \\
 6.25 \\
 \hline
 348.75 \\
 1395.0 \\
 \hline
 41850 \\
 2143593.75 \\
 21796875 \\
 \hline
 9)6539062 \\
 72.656+ \text{Ans}
 \end{array}$$

13. What will the wainscoting of a room come to at 80 cents per square yard; supposing the height of the room including the cornice and moulding. be 12 feet 6 inches. and the compass 83 feet 8 inches. three window shutters. each 4 feet 8 inches by 2 feet 6 inches. and the door 4 feet by 3 feet 6 inches. the shutters and door being worked on both sides. are reckoned work and half.

Ans. 96 dolls. 60 $\frac{2}{3}$ cts.

$$\begin{array}{r}
 \text{ft} \quad \text{in} \\
 4 \quad 8\frac{2}{3} \\
 \hline
 23 \quad 0 \\
 2.5 \\
 \hline
 11.5 \\
 46 \\
 \hline
 57.5 \\
 24.5 \\
 \hline
 2)820 \\
 41
 \end{array}$$

$$\begin{array}{r}
 \text{ft} \quad \text{in} \\
 3 \quad 5 \\
 \hline
 7 \\
 24.5 \quad \text{ft} \\
 83.666 \\
 12.5 \\
 \hline
 418330 \\
 1003992 \\
 \hline
 10458250 \\
 41 \\
 \hline
 10868280 \\
 9)86946000 \\
 96,602\frac{2}{3} \text{ Ans.}
 \end{array}$$

Decorative flourish

§§§ Section 5. §§§

By Duodecimals. ft in

$\div 3) 15351 \ 10 \ 6$
 $212) 5117$ (18 rods.
 $\underline{2397}$
 $68) 221$ (3 quarters.
 $\underline{17}$ feet.

$$\begin{array}{r}
 57 \text{ m} \\
 24 \text{ b} \\
 \hline
 228 \\
 174 \\
 \hline
 1368
 \end{array}$$

$$\begin{array}{r} 12 \overline{) 233472} \\ \underline{259744} \end{array}$$

$$\begin{array}{r} 272) 2337.72 (8.59 \text{ ang.} \\ \underline{2176} \\ 1617 \\ \underline{1360} \\ 2572 \\ \underline{2448} \\ 124 \end{array}$$

Ans 2 $\frac{1}{4}$ rods, 3 quarters 2 $\frac{1}{4}$ feet

$$\begin{array}{r}
 131^{\frac{1}{4}} \\
 4088 \\
 \hline
 68 \overline{) 229} \text{ 3 quarters} \\
 \underline{204} \\
 25 \text{ feet}
 \end{array}$$

Ans. 24 rods 3 quarters. 24 feet.

$$\begin{array}{r} 45 \text{ m} \\ 7 \text{ m} 6 \\ \hline 315 \\ 22 \text{ m} 6 \\ \hline 337 \text{ m} 6 \\ 5 \\ \hline 31686 \text{ m} 6 \\ 242562 (2 \text{ rods.}) \\ 544 \\ \hline 18 \text{ feet.} \end{array}$$

Masons Work

Examples.

1. If a wall be 94 feet 5 inches long. 18 feet 3 inches high. and 2 feet 3 inches thick. how many solid feet. and perches. are contained therein: By Decimals.

$$\begin{array}{r}
 94.417 \\
 1825 \\
 \hline
 187085 \\
 1918311 \\
 749336 \\
 94417 \\
 \hline
 177786025 \\
 225 \\
 \hline
 888930125 \\
 355572050 \\
 355572050 \\
 \hline
 10001885625 \text{ Solidity.}
 \end{array}$$

2. If many solid feet. and perches. are contained in a wall 53 feet 6 inches long. 12 feet 3 inches high. and 2 feet thick: Ans. 1310.45 feet. and

$$\begin{array}{r}
 52.9595 \text{ rods.} \quad \text{ft in} \\
 \text{rod in} \quad 12.25 \\
 \text{ft in} \quad 53.5 \\
 \hline
 198 \text{ inches in Br} \quad 6124 \\
 1584 \\
 198 \\
 \hline
 1213564 \\
 121297 \\
 \hline
 2475 \\
 24.75 \quad 1310.45 \text{ (52.9595 ans)} \\
 12375 \\
 7325 \\
 4950 \\
 \hline
 23750 \\
 22275 \\
 \hline
 14750 \\
 12375 \\
 \hline
 123750 \\
 12375 \\
 \hline
 1375
 \end{array}$$

3. If a wall be 104 feet 9 inches long. and 20 feet 6 inches high. how many superficial feet are contained therein: Ans. 2208 feet 10 inches.

$$\begin{array}{r}
 \text{ft in} \\
 104.9 \\
 20.6 \\
 \hline
 2140 \\
 53106 \\
 15 \\
 \hline
 2208106 \text{ Ans.}
 \end{array}$$

4. If a wall be 112 feet 3 inches long. and 16 feet 6 inches high: how many superficial rods. each 63 square feet. are contained therein: Ans. 29 rods 25 feet.

$$\begin{array}{r}
 \text{ft in} \\
 112.25 \\
 16.5 \\
 \hline
 56125 \\
 63000 \\
 \hline
 126000 \\
 592125 \\
 567000 \\
 \hline
 25125 \text{ feet}
 \end{array}$$

5. What is a marble slab worth. whose length is 5 feet 4 inches. and breadth 1 foot 10 inches. at 80 cents per foot superficial: Ans. 8 dolls. 19 cts.

$$\begin{array}{r}
 \text{ft in} \\
 5.4 \quad 10 \\
 1.10 \quad 10 \\
 \hline
 1:80::10:2:10 \\
 12 \quad 12 \\
 12 \quad 12 \\
 \hline
 144 \quad 144 \\
 80 \\
 \hline
 144 \quad 14920 \text{ (8.1875 cts Ans.)} \\
 1152 \\
 272 \\
 144 \\
 \hline
 1280 \\
 1152 \\
 \hline
 128
 \end{array}$$

Plasters Work James

Section 7.

By Duodecimals

$$\begin{array}{r} \text{ft. in.} \\ 59 \text{ } 9 \\ 24 \text{ } 6 \\ \hline 236 \\ 118 \\ \hline 29 \text{ } 10 \text{ } 6 \\ 18 \text{ } 0 \text{ } 0 \end{array}$$

$$\div 9) 1463 \text{ } 10 \text{ } 6 \\ \hline 162 \text{ } 5 \text{ } 10 \text{ } 6 \text{ Ans.}$$

1. If a ceiling be 59 feet 9 inches long and 24 feet 6 inches broad; how many superficial yards of 9 square feet does it contain;

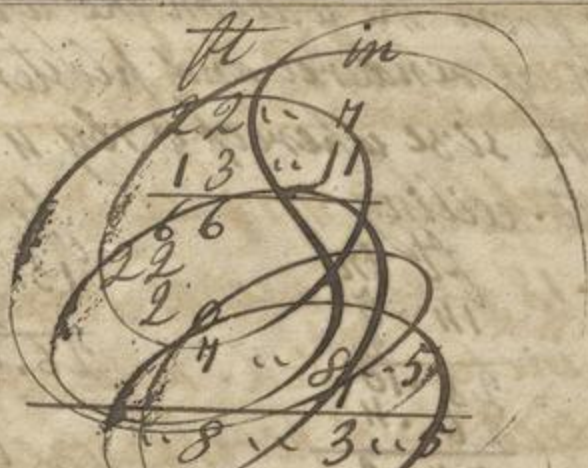
2. If the plastered partitions between rooms be 111 feet 6 inches about and 11 feet 3 inches high, how many yards do they contain: Ans. 146.87 yards.

$$\begin{array}{r} \text{ft. in.} \\ 111 \text{ } 6 \\ 112 \text{ } 6 \\ \hline 7075 \\ 2830 \\ \hline 1415 \\ 1415 \end{array}$$

$$\div 9) 1591875 \\ \hline 176845 \text{ yards Ans.}$$

3. What will the plastering of a ceiling come to at 15 cents per yard, allowing it to be 22 feet 7 inches long and 13 feet 11 inches broad:
~~Ans. 5 dolls. 20 cts.~~

Ans. 5 dolls. 20 cts.



$$\begin{array}{r} \text{ft in} \\ 22 \text{ } 7 \\ 13 \text{ } 11 \\ \hline 66 \end{array}$$

$$\begin{array}{r} 22 \\ 20 \text{ } 8 \text{ } 5 \\ 4 \text{ } 7 \end{array}$$

$$\div 9) 314 \text{ } 3 \text{ } 5$$

$$\begin{array}{r} 1:15:31 \text{ } 8 \text{ } 3 \text{ } 5 \\ 12 \text{ } 12 \\ \hline 2080 \\ 416 \end{array}$$

$$\div 12) 6240 \text{ } (520 \text{ Ans.}$$

4. The length of a room being 20 feet its breadth 11 feet 6 inches and height 10 feet 11 inches: how many yards of plastering does it contain deducting a fire-place of 11 feet by 11 feet 11 inches and two windows each 6 feet by 3 feet 2 inches:

$$\begin{array}{r} 20 \text{ } 11 \text{ } 6 \\ 110 \text{ } 2 \\ \hline 29 \text{ } 0 \\ 40 \text{ } 0 \\ \hline 69 \text{ } 10 \text{ } 11 \\ 69 \text{ } 0 \\ 23 \end{array}$$

$$\begin{array}{r} 713 \\ 55 \text{ } 11 \\ \hline 2654 \text{ } 8 \end{array}$$

$$\div 108 = 24$$

$$\begin{array}{r} \text{ft in} \\ 11 \text{ } 11 \\ 14 \text{ } 11 \end{array}$$

$$\begin{array}{r} \text{ft in} \\ 3 \text{ } 2 \text{ } 6 \\ 19 \text{ } 0 \\ 38 \text{ } 0 \\ 17 \text{ } 4 \\ \hline 55 \text{ } 11 \end{array}$$

5. The length of a room is 14 feet 5 inches. breadth 13 feet 2 inches. and heig 9 feet 3 inches. to the under side of the cornice. with projects 5 inches from the wall on the upper part next the ceiling: required the quantity of rendered and plastering: there being no deductions but for one door. the size whereof is 7 by 11 feet: Ans. 53 yds. 5 feet. of rendering. and 18 yds. 5 ft. ceiling

$$\begin{array}{r}
 \text{ft in} \\
 14 \text{ ft } 5 \\
 28 \text{ ft } 10 \\
 26 \text{ ft } 11 \\
 \hline
 55 \text{ ft } 2 \\
 9 \text{ ft } 3 \\
 \hline
 49 \text{ ft } 5 \\
 13 \text{ ft } 9 \text{ in } 6 \\
 1 \text{ ft } 6 \text{ in } 6 \\
 \hline
 51 \text{ ft } 0 \text{ in } 3 \text{ in } 6 \\
 28 \\
 \hline
 9) 482 \text{ ft } 3 \text{ in } 6 \\
 53 \text{ yds } 5 \text{ ft } \text{ Ans.}
 \end{array}$$

$$\begin{array}{r}
 \text{ft in} \\
 13 \text{ ft } 2 \\
 26 \text{ ft } 11 \\
 \hline
 28 \text{ ft } 7 \text{ in } 11 \\
 28
 \end{array}$$

$$\begin{array}{r}
 \text{ft in} \\
 13 \text{ ft } 7 \\
 12 \text{ ft } 11 \\
 \hline
 156 \text{ ft } 6 \text{ in } 11 \\
 9) 167 \text{ ft } 6 \text{ in } 11 \\
 18 \text{ yds } 5 \text{ ft } \text{ Ans.}
 \end{array}$$

6. If a circular vaulted roof of a church measures 105 feet 6 inches in the arch and 275 feet 5 inches in length what will the plastering come to at 12 cents per yard: Ans. 387 dolls. 42 cts.

$$\begin{array}{r}
 \text{ft in} \\
 275 \text{ ft } 5 \\
 105 \text{ ft } 6 \\
 \hline
 1375 \text{ ft } 30 \text{ in } 6 \\
 2750 \text{ ft } 13 \text{ ft } 8 \text{ in } 6 \\
 413 \text{ ft } 9 \text{ in } 6 \\
 \hline
 9:12::29056 \text{ ft } 5 \text{ in } 6 \\
 12 \\
 \hline
 108 \text{ ft } 348 \text{ ft } 7 \text{ in } 4 \\
 12 \\
 \hline
 1296 \text{ ft } 4184 \text{ ft } 13 \text{ in } 0 \\
 12 \\
 \hline
 1296 \text{ ft } 5020 \text{ ft } 9 \text{ in } 5 \text{ in } 6 \text{ in } 0 \\
 3888 \\
 \hline
 113 \text{ ft } 2 \text{ in } 9 \\
 103 \text{ ft } 6 \text{ in } 8 \\
 \hline
 96 \text{ ft } 1 \text{ in } 5 \\
 90 \text{ ft } 7 \text{ in } 2 \\
 \hline
 54 \text{ ft } 3 \text{ in } 6 \\
 51 \text{ ft } 8 \text{ in } 11 \\
 \hline
 25 \text{ ft } 2 \text{ in } 0 \\
 25 \text{ ft } 9 \text{ in } 2
 \end{array}$$

Ans. 387.42 nearly

7. What will the white washing of a room come to at 2 cents per yard. allowing it to be 30 feet 6 inches long 24 feet 9 inches broad. and 10 feet high: no deductions being made for vacuities. Ans. 1 doll. 13 1/2 cts.

$$\begin{array}{r}
 30.5 \text{ ft } 6 \text{ in } \\
 24.75 \text{ ft } 9 \text{ in } \\
 \hline
 61.0 \text{ ft } 15 \text{ in } \\
 24.75 \text{ ft } 9 \text{ in } \\
 \hline
 110 \text{ ft } 5 \text{ in } 0 \\
 110 \text{ ft } 5 \text{ in } 0 \\
 \hline
 110 \text{ ft } 5 \text{ in } 0 \\
 45 \text{ ft } 4 \text{ in } 8 \text{ in } 7 \text{ in } 5 \\
 \hline
 9:2::1859 \text{ ft } 8 \text{ in } 7 \text{ in } 5 \\
 9.000) 3419 \text{ ft } 4 \text{ in } 5 \text{ in } 0 \\
 36000 \\
 \hline
 119 \text{ ft } 7 \text{ in } 5 \\
 140 \text{ ft } 0 \text{ in } 0 \\
 \hline
 29 \text{ ft } 7 \text{ in } 5 \text{ in } 0 \\
 27 \text{ ft } 0 \text{ in } 0 \text{ in } 0 \\
 \hline
 27 \text{ ft } 5 \text{ in } 0 \text{ in } 0 \\
 27 \text{ ft } 5 \text{ in } 0 \text{ in } 0 \\
 \hline
 500
 \end{array}$$

Ans. 1.13.3

Pavers Work

III Sections. III

1. What cost the paving of a street 225 feet 6 inches long and 60 feet 6 inches wide at 30 cents per square yard By Duodecimals.

$$\begin{array}{r}
 \text{ft in} \\
 225.6 \\
 60.6 \\
 \hline
 13509 \\
 112.9 \\
 30.9 \\
 \hline
 \div 9) 13642.9 \\
 1515.1.9 \\
 30 \\
 \hline
 1154.50 \\
 26 = \text{the piece of 4 ft 9 inches}
 \end{array}$$

2. What will the paving of a foot path come to at 28 cents per yard. the length being 35 feet 4 inches and the breadth 8 feet 3 inches. Ans. 9 dolls. 4 cts.

$$\begin{array}{r}
 \text{ft in} \\
 35.4 \\
 8.3 \\
 \hline
 280 \\
 8100 \\
 \hline
 9:28::29160 \\
 12 \\
 108 \quad 3498 \\
 28 \\
 \hline
 27284 \\
 6996 \\
 \hline
 108) 97944 (906 + \text{Ans.} \\
 972 \\
 \hline
 744 \\
 648 \\
 \hline
 96
 \end{array}$$

3. What cost the paving of a court yard at 38 cents per yard. the length being 24 feet 10 inches and the breadth 14 feet 9 inches.

Ans. 17 dolls. 33 1/2 cts

$$\begin{array}{r}
 24.10 \\
 14.9 \\
 \hline
 298 \\
 20106 \\
 11866 \\
 \hline
 9:38::4192 \\
 12 \\
 108 \quad 4926 \\
 1296 \quad 59118 \\
 38 \\
 \hline
 442944 \\
 144354 \\
 \hline
 1296) 2246484 (1733.3 + \text{Ans.} \\
 1296 \\
 \hline
 9504 \\
 9042 \\
 \hline
 4328 \\
 3888 \\
 \hline
 4404 \\
 3888 \\
 \hline
 5140 \\
 2888 \\
 \hline
 1252
 \end{array}$$

11. What will be the expense of paving a rectangular yard whose length is 63 feet and breadth 45 feet in which there is laid a foot path 5 feet 3 inches broad running the whole length with broad stones at 36 cents a yard the rest being paved with pebbles at 20 cents a yard. Ans. 96 dolls. 07 1/2 cts

$$\begin{array}{r}
 63 \\
 45 \\
 \hline
 315 \\
 252 \\
 \hline
 283500 \\
 330.75 \\
 \hline
 9:30::2504250 \\
 900) 7512750 (8347.5 \\
 7200 \\
 \hline
 3127 \\
 2400 \\
 \hline
 7275 \\
 6600 \\
 \hline
 6750 \\
 4500 \\
 \hline
 2250 \\
 63 \\
 \hline
 1545 \\
 3150 \\
 \hline
 9:36::33075 \\
 36 \\
 \hline
 198450 \\
 99225 \\
 \hline
 900) 1190700 (1323 \\
 900 \\
 \hline
 2907 \\
 2700 \\
 \hline
 2070 \\
 1800 \\
 \hline
 2700 \\
 2400 \\
 \hline
 300
 \end{array}$$

mestack

Ans.

Pailers Work

§ Section 9. § 1. How many yards of painting will a room contain which (being girt over the mouldings) is 16 feet 6 inches. and the compass of the room 94 feet 6 inches:

By Decimals.

ft. in
94 6 = 94.5

16 6 = 16.5

16.5

5850

975

9) 1608.75 feet

Yards 178.6.75

the breaks in the window 14 inches deep. and 8 feet high: the opening for the chimney 6 feet 9 inches by 5 feet. to be deducted. the shutters and door are painted on both sides: what will the whole come to: Ans. 10 dolls. 13 cts.

7-6
3-9
21
5-7-6
7-6
28-1-6
ft
69
5
33-9

ft in
74-10
11-7
74
743-7-10
9-2
866-9-10
111 1 4
28 1 6
46 8
1052 8 8
33 9 8
9) 1018 11 8
113-1-11-8
82
904.5
565
9.60.5 Ans

8
16-8
22 8-2
22 8-2
2 9-11
26-5-11
132-2-8 breaks
111-1-11
9-11
46-8 breaks

3. How many yards of painting are there in a room. the length where of is 20 feet. its breadth 11 feet 6 inches. and height 10 feet 4 inches: deducting a fire place of 4 feet by 4 feet 11 inches. and two windows. each 6 feet by 3 feet 2 inches: Ans. 732.24 yards.

20
2
40
11-6
29-0
40
69 0
10 4
690
23
713
55-11
9) 654-8
12
108
73-8-2
108-24 Ans

ft in
11-11
4
17-11
3-2
6
19-0
3-8-0
17-11
55-11

11. What cost the painting of a room at 6 cents per yard: its length being 24 feet 6 inches. its breadth 16 feet 3 inches. and height 12 feet 9 inches: also the door is 7 feet by 3 feet 6 inches. and the window shutters of two windows. each 7 feet 9 inches by 3 feet 6 inches. but the breaks of the windows themselves. are 8 feet 6 inches high. and 1 foot 3 inches deep: deducting a place of 5 feet by 5 feet 6 inches: Ans. 4 dolls. 11 + cts.

16.3	24.6	7.0.6	7.9.6	8.6.3
16.3	24.6	21.0.6	23.3	8.6.3
32.6	32.6	3.6	23.3	2.1.6
	81.6	24.6	27.1.6	10.7.6
	12.9	54.3	54.3.0	21.3.0
		21.3	54.3.0	21.3.0
		100.0		21.3.0
				ft in
				5 6
				27.6
				Chimney

948.0	1039.1.6	100.0.0	1139.1.6	24.6	9.1.1.1.4.6	123.11.7.6	4.3.8	4.41	Ans.
61.1.6									
1039.1.6									
100.0.0									
1139.1.6									
24.6									
9.1.1.1.4.6									
123.11.7.6									
4.3.8									
4.41									
Ans.									

1296	3996	3
	3888	
	108	

James McComick

Glaziers Work

Section 10. 1. How many square feet are contained in a window which is 11 feet 3 inches long. and 2 feet 9 inches broad: By Duodecimals.

11.3	2.9
8.6.3	
2.2.3	
11.8.3	Ans.

2. If a window be 14 feet 3 inches high. and 3 feet 5 inches broad. how many square feet of glazing are contained therein: Ans. 24 feet 9 inches.

14.3	3.5
21.9	
3.0.3	
24.9.3	Ans.

B

3. There is a house with three tiers of windows. 7 in a tier. the height of the first tier is 6 feet 11 inches. of the second. 5 feet 11 inches. and the third. 4 feet 3 inches: the length of each window is 3 feet 6 inches: what will the glazing come to at 14½ cents per foot: Ans. 58 dolls. 61 cts.

$$\begin{array}{r} 6 \text{ } 11 \\ 5 \text{ } 11 \\ 4 \text{ } 3 \\ \hline 16 \text{ } 6 \end{array}$$

$$\begin{array}{r} 3 \text{ } 6 \\ 2 \text{ } 11 \text{ } 6 \\ \hline 16 \text{ } 6 \end{array}$$

4.3 29.9 3.6 14.40.6 89.3 1011.1.6	6.11 48.5 3.6 24.2.6 145.3 169.5.6 1011.1.6 130.8.0	5.11 27.11 3.6 18.8 112.0 130.8.0
---	--	--

$$\begin{array}{r} 12 : 14\frac{1}{2} : 110\frac{1}{2} \\ \hline 12 \end{array}$$

$$\begin{array}{r} 19494 \\ 4851 \\ \hline 2125.5 \end{array}$$

$$12.0 \overline{) 70339.5} (58.61 \text{ Ans.}$$

$$\begin{array}{r} 1033 \\ 960 \\ \hline 730 \\ 720 \\ \hline 100 \\ 100 \\ \hline 0 \end{array}$$

What will the glazing of a triangular skylight come to at 10 cents per foot. the base being 12 feet 6 inches long. and the perpendicular height 16 feet 9 inches: Ans. 10 dolls. 16½ cts.

$$\begin{array}{r} 12 \text{ } 6 \\ 8 \text{ } 11 \text{ } 6 \\ \hline 100 \text{ } 0 \\ 4 \text{ } 2 \text{ } 3 \\ \hline 1256 \end{array}$$

$$\begin{array}{r} 12 : 10 : 110\frac{1}{2} \\ \hline 12 \\ 1256 \\ 150450 \\ \hline 1111 \overline{) 150450} (10.16\frac{7}{8} \text{ Ans.} \end{array}$$

$$\begin{array}{r} 675 \\ 576 \\ \hline 990 \\ 864 \\ \hline 126 = 21 = 7 \\ 111 = 21 = 8 \end{array}$$

5. What is the area of an elliptical fan light of 14 feet 6 inches in length. and 11 feet 9 inches in breadth.

Ans. 68 feet 10 inches

$$\begin{array}{r} 14 \text{ } 6 \\ 11 \text{ } 9 \\ \hline 580 \\ 10 \text{ } 10 \text{ } 6 \\ \hline 68 \text{ } 10 \text{ } 6 \end{array} \text{ Ans.}$$

6. There is a house with three tiers of windows. and 9 in each tier: the height of the first tier is 7 feet 10 inches. of the second. 6 feet 8 inches. of the third. 5 feet 11 inches: what will the glazing come to at 14 cents per foot:

Ans. 97 dolls. 8½ cts.

Proper
J R

$$\begin{array}{r} 3 \cdot 11 \\ 35 \cdot 3 \end{array}$$

$$\begin{array}{r} 7 \cdot 10 \\ 6 \cdot 1 \\ 19 \cdot 10 \\ 35 \cdot 3 \\ 95 \end{array}$$

$$\begin{array}{r} 4 \cdot 11 \cdot 6 \\ 29 \cdot 2 \\ 11 \cdot 6 \end{array}$$

$$\begin{array}{r} 11 \cdot 11 \cdot 6 \\ 12 \cdot 11 \cdot 6 \\ 12 \cdot 11 \cdot 6 \\ 11 \cdot 11 \cdot 6 \end{array}$$

$$\begin{array}{r} 8289 \\ 100694 \\ 100694 \\ 100694 \end{array}$$

$$\begin{array}{r} 102696 \\ 100694 \\ 100694 \end{array}$$

$$\begin{array}{r} 11409436 \\ 1296 \\ 1134 \\ 1008 \end{array}$$

$$\begin{array}{r} 1263 \\ 1134 \\ 1008 \end{array}$$

$$\begin{array}{r} 1116 \\ 1008 \\ 1008 \end{array}$$

$$\begin{array}{r} 1008 \\ 1008 \\ 1008 \end{array}$$



E859
204

Measurement of Ground

Section II. In the square of a field. A. B. C. D.

each side of which measures 40 rods or poles. how many acres:

operation.

$$\begin{array}{r} 40 \\ 40 \\ 1600 \\ 40 \\ 160 \end{array}$$

Acres. Ans.

P C



2. In a square field. each side of which measures 35 two pole chains. how many acres: Ans. 30 acres 2 rods 20 perches.

$$\begin{array}{r} 35 \\ 2 \\ 70 \\ 1004900 \\ 1122-20 \\ 30-2-20 \end{array}$$

Ans.

Examples.

1. There is an oblong square piece of ground. A. B. C. D. the longest sides of which measure 64 perches. and the shortest sides or ends. measure 40: how many acres does it contain.

Operation.

64 = the length
40 = the breadth

$$\begin{array}{r} 64 \\ 40 \\ 2560 \end{array}$$

16 Acres. Ans.

3. A piece of square ground measures 16 1/2 perches on each side: what is the content in acres. Ans. 1 acre 2 rods 32 1/2 perches.

$$\begin{array}{r} 16.5 \\ 16.5 \\ 272.25 \\ 160 \\ 10112 \end{array}$$

1 acre

2 rods.

James?



2. In a piece of ground lying in the form of an oblong square. the length measures 120 perches and the breadth 84. what is its content in acres.

$$\begin{array}{r} 120 \\ 84 \\ \hline 480 \\ 960 \\ 160 \overline{) 10080} \end{array} \quad \begin{array}{l} \text{Ans. 63 acres.} \\ 63 \text{ Ans} \end{array}$$

3. A lot of ground lying in the form of an oblong square. measures 240 feet in length. and 120 in breadth: what is its content in acres. Ans. 6 acres 2 quarters 25 perches 213 $\frac{3}{4}$ feet.

$$\begin{array}{r} 240 \\ 120 \\ \hline 4800 \\ 240 \\ \hline 28800 \\ 1089 \overline{) 115200} \end{array} \quad \begin{array}{l} 105 \text{ perches} \\ 1089 \\ 6300 \\ 5115 \\ \hline 14855 \\ 213 \frac{3}{4} \end{array}$$

4. There is an oblong piece of ground whose length is 14 two pole chains 25 links. and breadth 8 chains 34 links: how many acres does it contain:

$$\begin{array}{l} 8.34 = 17.118 \text{ breadth} \\ 14.25 = 29 \text{ length} \end{array}$$

$$\begin{array}{r} 15732 \\ 3496 \\ \hline 40 \overline{) 50692} \\ 11226 \\ \hline 302692 \end{array}$$

Ans. 3 acres 0 quarters 27 perches nearly.

5. An oblong piece of ground measures 17 two pole chains and 21 links in length. and 15 chains 38 links in breadth: how many acres are contained therein:

$$\begin{array}{r} 17.21 \\ 21 \\ \hline 34.84 \end{array}$$

$$\begin{array}{r} 15.38 \\ 38 \\ \hline 31.52 \end{array}$$

$$\begin{array}{r} 34.84 \\ 31.52 \\ \hline 69.68 \end{array}$$

$$\begin{array}{r} 69.68 \\ 14420 \\ \hline 3484 \end{array}$$

$$\begin{array}{r} 10452 \\ 160000 \overline{) 10981568} \end{array}$$

$$\begin{array}{r} 10981568 \\ 9600000 \\ \hline 1381568 \\ 40 \overline{) 1381568} \\ 3418 \end{array} \quad \begin{array}{l} 6 \text{ acres} \\ 3418 \end{array}$$

Rule.

Rule.

1. let A.B.C. be a triangular piece of ground. the longest side or base B.C. is 24 chains 38 links. and perpendicular A.D. 13 chains 28 links: how many acres does it contain

Operation.

$$\begin{array}{l} \text{ch. } 24.38 = 49.52 \text{ perches} \\ 13.28 = 27.12 \end{array}$$

$$\begin{array}{r} 9904 \\ 4952 \\ \hline 34664 \\ 9904 \\ \hline 9824 \end{array}$$

$$\begin{array}{r} 1342 \\ 6714912 \end{array}$$

$$\begin{array}{r} 6714912 \\ 1631 \\ \hline 110311 \end{array}$$

Ans. 11 acres 0 roods 31.11 perches

2. In a triangular piece of ground. the base or longest side measures 45 perches. and the perpendicular 50: how many acres does it contain

Ans. 11 acres 2 ~~quarts~~ qrs. 35 perches.

$$\begin{array}{r} 45 \\ 50 \\ \hline 2 \overline{) 2250} \\ 40 \overline{) 1875} \\ 4 \overline{) 116} = 35 \end{array} \text{ Ans.}$$

1. Let A. B. C. D. be a piece of ground in the forme of an oblique parallelogram. the base of which. A. B. measures 44 perches. and the perpendicular. D. E. 40 perches. how many acres does it contain:

$$\begin{array}{r} 44 \text{ length} \\ 40 \text{ breadth} \\ \hline 40 \overline{) 1760} \\ 4 \overline{) 11} = 11 \text{ acres. Ans.} \end{array}$$

3. How many superficial yards are contained in a triangular piece of ground. the base of which measures 120 perches. and the perpendicular 84 perches: Ans. 1417 dolls. 50cts.

$$\begin{array}{r} 84 \\ 120 \\ \hline 1680 \\ 84 \\ \hline 2 \overline{) 10080} \\ 40 \overline{) 5040} \\ 4 \overline{) 126} \\ \text{ft } 126 \div 45 = 3 \text{ } 1 = 2 \\ \frac{1}{11} \div \frac{1}{11} = 1 \\ \hline 126 \\ 45 \\ \hline 630 \\ 504 \\ \hline 4 \overline{) 5670} \\ 1417.50 \text{ Ans.} \end{array}$$

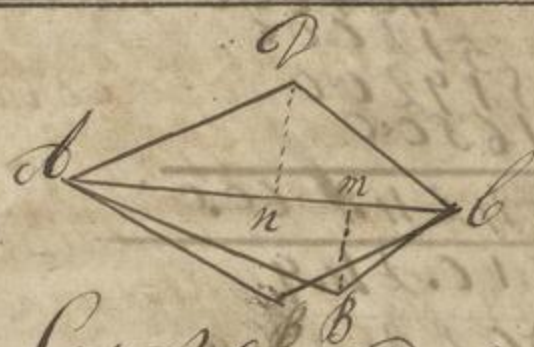
2. A piece of ground lying in the form of an oblique parallelogram. is found to measure 80 perches along its base. and its perpendicular or height 24 perches. how many acres does it contain.

$$\begin{array}{r} 80 \\ 24 \\ \hline 320 \\ 160 \\ \hline 40 \overline{) 1920} \\ 4 \overline{) 48} = 12 \text{ Ans.} \end{array}$$

Ans. 12 acres.



III Example. III



1. Let A. B. C. D. be a field with four irregular and unequal sides. the diagonal line of which. A. C. measures 80 perches. the perpendicular. B. m. measures 25 perches. and the other perpendicular. D. n. 35 perches: how many acres does it contain:

11. How many superficial yards are contained in a triangular piece of ground. the base of which measures 140 feet. and the perpendicular 70 feet: Ans. 511 yards 11 feet.

$$\begin{array}{r} 140 \\ 70 \\ \hline 2 \overline{) 9800} \\ 9 \overline{) 4900} \\ 511 = 11 \text{ Ans.} \end{array}$$

1211111

Operation: ^{onal line}
 80 the length of the diag
 $25+35=60$ the sum of the two perpen
 $\frac{24800}{110} 2400$ perches.
 $\frac{1160}{15}$ acres. Ans.

2. In a field of four unequal sides.
 the diagonal line between the two m
 ost distant corners. measures 120 rods.
 and the perpendiculars measures. the
 one 48. and the other 24 rods: requires
 the number of acres it contains:

$\frac{48}{24} 72$
 $\frac{120}{72} 240$
 $\frac{240}{840} 28640$
 $\frac{110}{11320} 108$
 $\frac{110}{24}$ Ans.

Example 5

1. How many acres are contained in a
 circular piece of ground. whose dia
 meter measures 320 perches. or one
 mile $320 \times 320 = 102400$

$\frac{102400}{38511} 109600$
 $\frac{512000}{819200} 716800$
 $\frac{110}{80424.60.0}$
 $\frac{110}{2010.24.9}$
 502.2.24.9

Ans. 502 acres 2 qrs. 24.9 perches.

2. A gentleman has an ellip
 tical yard. in front of his
 house. the longest diameter of
 which measures 30 perches. and
 the shortest 20: how much ground
 is contained herein

Ans. 2 acres 3 qrs. 31.2 perches.

$\frac{785400}{110} 471.2400$
 $\frac{110}{11.31.24}$
 2.3.31.24 Ans.

3. How many square yards are
 contained in a circular piece of
 ground. the diameter of which
 measures 160 feet:

Ans. 2234 + yards.

$\frac{160}{160} 9600$
 $\frac{160}{25600} 7854$
 $\frac{102400}{128000} 204800$
 $\frac{149200}{20106.24.00}$
 2234 + Ans.

Gauging. Sam

Section 12 1. How many gallons of wine will a cask contain whose bung diameter is 31 inches. head diameter 25 inches. and whose length is 3 feet. or 36 inches:

$$\begin{array}{r}
 31 \text{ bung diam.} \quad 25 \\
 25 \text{ head diam. } \frac{2}{3} \text{ of } 6 = 11 \\
 6 \text{ difference. } 3 \quad 29 \\
 \hline
 261 \\
 58 \\
 \hline
 811 \\
 36 \text{ square of the mean diam} \\
 \hline
 5616 \text{ the length} \\
 2523 \\
 \hline
 30276 \text{ cubic inches.}
 \end{array}$$

Then $30276 \div 2911 = 102 \frac{288}{2911}$ gals. Or 102 gals. 39 pt. $1 \frac{22}{38}$ pt.

2. The diameter of a barrel at the bung measures 24 inches. and at the head 18 inches. and its length is 24 inches; what is its content in wine measure: Ans. $39 \frac{25}{119}$ gals.

$$\begin{array}{r}
 24 \\
 18 \\
 \hline
 6 \quad \frac{2}{3} \text{ of } 6 = 11 \\
 \hline
 22 \\
 44 \\
 \hline
 44 \\
 484 \\
 24 \\
 \hline
 1936 \\
 468 \\
 \hline
 1468 \\
 2911 \overline{) 14616} \quad 39 \frac{25}{119} \text{ gals.} \\
 \hline
 882 \\
 2496 \\
 \hline
 2616 \\
 \hline
 1506 = 25 \\
 6 \overline{) 244} \quad 119
 \end{array}$$

Mechanical Powers

Section. 13

1. If a man weighing 150 lb. rest on the end of a lever 12 feet long: what weight will he balance on the other end. supposing the prop $1\frac{1}{2}$ foot from the weight.

12 = the length of the lever

1.5 = distance of the weight from the prop

10.5 = the distance from the prop to the man

Then as 1.5 : 10.5 :: 150 : 105. Ans.

2. The pea of a pair of steel-yards weighing 5 lb. is removed 20 inches back from the fulcrum: what weight will it balance suspended at 1 inch distance on the opposite side: Ans. 100 lb.

in in lb
1 : 20 :: 5 : 100
100 Ans.

1. It is required to make a windlass be equal to 12 lb. suspended to the axle: now allowing the axle to be 11 inches diameter. what must be the diameter of the wheel:

as 1 : 11 :: 12 : 118 = $1\frac{1}{2}$ feet the diam. of the wheel. Ans.

2. Suppose the diameter of an axle to be 6 inches. and the radius of the wheel 5 feet: what power at the wheel will balance 10 lb. at the axle: Ans. 1 lb.

ft lb in
5 : 10 :: 6 : 1
60) 60
1 lb Answer

Examples.

There is a screw whose threads are an inch asunder: the lever by which it is turned is 36 inches long. and the weight to be raised a ton. or 2240 lb.: what power or force must be applied to the end of the lever sufficient to turn the screw that is to raise this weight.

Thus. the lever $36 \times 2 = 72$. and $72 \times 3.14159 = 228.191$ the circumference.

Then as 228.191 : 1 :: 2240 : 10266 the power Ans



James Promiscuous

Promiscuous Questions

Examples.

1. What is the sum of 2578. added to itself: Ans. 5156.

$$\begin{array}{r} 2578 \\ 2578 \\ \hline 5156 \end{array} \text{ Ans.}$$

5. What number is that which being multiplied by 115. the product will be 1080: Ans. 24.

$$\begin{array}{r} 115 \overline{) 1080} \\ \underline{90} \\ 180 \end{array} \text{ Ans.}$$

2. What is the difference between 11676. and the fourth of it self: Ans. 11007.

$$\begin{array}{r} 11676 \\ 3669 \\ \hline 11007 \end{array} \text{ Ans.}$$

3. There is the sum of 11168 dollars in three bags: the first contains 1161. the second 581. how many are in the third bag: Ans. 1126.

$$\begin{array}{r} 1168 \\ 1161 \\ 581 \\ \hline 1126 \end{array} \text{ Ans.}$$

4. What is the sum of the third and half third of 1 dollar: Ans. 50 cts.

$$\begin{array}{r} 3100 \\ 233\frac{1}{3} \\ \hline 50 \end{array}$$

6. Required the quotient of the square of 1176. divided by the half of its root: Ans. 952.

$$\begin{array}{r} 1176 \\ 1176 \\ \hline 2856 \\ 3332 \\ \hline 1904 \\ 226576 \\ \hline 16 \\ 665 \\ 609 \\ \hline 946 \\ 5676 \\ \hline 238 \\ 2112 \\ \hline 1237 \\ 1790 \\ \hline 1176 \end{array}$$

7. A general drawing up his army into a solid square. found he had 231 over and above. but increasing each side with one soldier, he wanted 11 to complete the square: how many men did his army consist of: Ans. 19000.

$$\begin{array}{r} 231 \\ 11 \\ \hline 275 \\ 275 \\ \hline 2275 \\ 137 \\ \hline 137 \\ 959 \\ \hline 111 \\ 134 \\ \hline 18769 \\ 231 \\ \hline 19000 \end{array} \text{ Ans.}$$

8. What number added to the cube of 21. will make the sum equal to 113 times 1114. Ans. 7350.

$$\begin{array}{r} 21 \\ 21 \\ 21 \\ 42 \\ 441 \\ 21 \\ 441 \\ 882 \\ \hline 9261 \end{array} \quad \begin{array}{r} 117 \\ 113 \\ 441 \\ 117 \\ 16611 \\ 9261 \\ \hline 7350 \end{array} \text{ Ans.}$$

9. A person possessed of $\frac{3}{8}$ of a ship. sold $\frac{2}{5}$ of his share for 1260 dollars: what was the value of the whole ship at the same rate: Ans. 5040 dollars.

$$\frac{2}{3} \times \frac{3}{8} = \frac{6}{24} = \frac{1}{4}$$

$$\frac{1}{4} : 1260 :: 1 : 5040 \text{ Ans.}$$

10. A guardian paid his ward 3500 dollars for 2500 dollars. which he had in his hands for 8 years: what rate of interest did he allow him: Ans. 5 per cent.

$$\begin{array}{r} 3500 \\ 2500 \\ \hline 2500 : 1000 :: 100 \\ 11000000 \text{ Quo} \\ \hline 1000000 \text{ Ans.} \end{array}$$

11. A young man received 210 dolls. which was $\frac{2}{3}$ of his elder brother's portion: now three times the elder brother's portion was half of the father's estate: how much was the estate worth: Ans. 1890.

$$\begin{array}{r} 210 \\ 3 \\ \hline 21630 \\ 315 \\ \hline 945 \\ 1890 \end{array} \text{ Ans.}$$

12. A broker bought four his principal in the year 1720. the sum of 100 dollars capital stock. in the south sea. at 650 per cent. and sold it again when it was worth but 130 dollars per cent: how much was lost in the whole: Ans. 2080 dollars

$$\begin{array}{r} 100 : 650 :: 100 : 650 \\ 100 : 130 :: 100 : 130 \\ \hline 260000 \\ 52000 \\ \hline 208000 \text{ Ans.} \end{array}$$

13. A gentleman went to sea at 14 years of age: 8 years after he had a son born. who lived 116 years. and died before his father: after whom the father lived twice 20 years. and then died also: I demand the age of the father when he died: Ans. 111 years

$$\begin{array}{r} 14 \\ 8 \\ 116 \\ 20 \\ 20 \\ \hline 178 \end{array} \text{ Ans.}$$

14. A. B. and C. entered into partnership in trade. A put in a sum unknown. B put in 20 pieces of cloth. and C put in 500 dollars: at the end of one year they had gained 1000 dolls. whereof A received 350 dollars for his share. and B 400 dolls: required C's share. how much A put in. and the value of B's cloth: Ans. C's share 250 dolls. - A put in 700 dolls. - B's cloth was worth 800 dolls.

$$\begin{array}{r} 1000 \\ 750 \\ \hline 250 \end{array}$$

$$\begin{array}{r} 350 \\ 100 \\ \hline 750 \end{array}$$

$$250:500::350$$

$$\begin{array}{r} 250 \overline{) 175000} \\ \underline{250} \\ 00 \end{array}$$

$$250:500::100$$

$$\begin{array}{r} 250 \overline{) 200000} \\ \underline{250} \\ 00 \end{array}$$

15. A captain and 160 sailors took a prize worth 2720 dolls. of which the captain gets $\frac{1}{2}$ for his share. and the rest is equally divided among the sailors: what was each one's part: Ans. the captain gets 511 dolls. and each sailor 13 dollars. 60 cts.

$$\begin{array}{r} 2720 \\ 511 \frac{1}{2} \text{ Captain} \\ 160 \overline{) 2176} \text{ (13.60 Each sailor)} \\ \underline{160} \\ 576 \\ \underline{480} \\ 960 \end{array}$$

16. A lady tells her husband. upon their marriage. that her fortune. the interest of which for one year. at 6 per cent. was 972 dollars. was but the $\frac{2}{3}$ of the interest of her father's estate for three years. at the same rate per cent: what was the lady's fortune. and what was the value of her father's estate: Ans. Her fortune was 16200 dollars. and her father's estate was 150000 dollars.

$$\begin{array}{r} 6:100::972 \\ 100 \end{array}$$

$$\begin{array}{r} 6 \overline{) 97200} \\ \underline{16200} \end{array} \text{ the Ladies fortune.}$$

$$\begin{array}{r} 6 \overline{) 381000} \\ \underline{327000} \end{array} \text{ Interest for 3 years.}$$

$$6:100::9000$$

$$\begin{array}{r} 6 \overline{) 900000} \\ \underline{150000} \end{array} \text{ the Fathers fortune}$$

17. A stone measures 11 feet 6 inches long. 2 feet 9 inches. broad. and 3 feet 11 inches deep: how many cubic feet does it contain:

Ans. 11 feet 3 inches.

ft	in
11	6
2	9
3	11
11	3

Ans.

18. Suppose $\frac{1}{3}$ of a mast or pole stands in the ground. 12 feet in the water. and $\frac{5}{6}$ of its length above the water. what is its whole length? Ans. 216 feet.

$$\begin{array}{r} \frac{1}{3} \frac{5}{6} \\ 3 \overline{) 9 \frac{5}{6}} \\ \underline{3} \\ 6 \\ \underline{6} \\ 0 \end{array}$$

$$\begin{array}{l} 2 \times 1 = 2 \\ 3 \times 5 = 15 \\ \hline 17 \\ 18 \end{array}$$

from 1
Take $\frac{17}{18}$

$1:12::18$
 $\frac{12}{18}$ Ans.

19. A gentleman being asked his age. answered. ~~my~~ my grand father is 112 years old. and my father is $\frac{4}{7}$ of his age. whilst mine is but $\frac{1}{5}$ of my father's: what was his age? Ans. $21\frac{1}{2}$ years.

$$\begin{array}{r} 112 \\ 7 \overline{) 448} \\ \underline{64} \\ 1 \end{array}$$

$3 \overline{) 6 \frac{1}{2}}$ years Ans.

20. A person who was possessed of $\frac{2}{5}$ share of a copper mine. sold $\frac{2}{11}$ of his interest therein for 1710 dollars; what was the value of the property at the same rate? Ans. 3800 dolls.

$$\frac{\frac{2}{5} \frac{3}{11} = \frac{9}{20}}$$

$\frac{9}{20} : 1710 :: \frac{1}{1} = 3800$
 $9 \overline{) 34200}$ (3800 Ans.)

21. There are two numbers. the one 63. the other half as much: required the product of their squares. and the difference of their product and sum:

Ans. { Product of the squares 39382 40.25.
Difference 1890.

$$\begin{array}{r} 2 \overline{) 63} \\ \underline{31.5} \\ 94.5 \\ \underline{1890} \\ 1984.5 \\ \underline{945} \\ 1890.0 \end{array}$$

Difference

$$\begin{array}{r} 63 \\ 63 \\ \underline{3189} \\ 3789 \\ \underline{3969} \end{array}$$

$$\begin{array}{r} 2 \overline{) 63} \\ \underline{31.5} \\ 94.5 \\ \underline{1890} \\ 1984.5 \\ \underline{945} \\ 1890.0 \end{array}$$

ct
product

22. Two men set out at the same time from the same place. but go contrary ways. and each of them travel 34 miles a day; required the time in which they will have travelled 2000 miles? Ans. 29 days 9 hours 52 $\frac{64}{68}$ minutes.

$$\begin{array}{r} 34 \\ 34 \\ \hline 68 : 1 :: 2000 \\ 68 \overline{) 2000} \end{array} \quad \begin{array}{r} 29 \text{ Days.} \\ 186 \\ \hline 640 \\ 612 \\ \hline 28 \\ 211 \\ \hline 112 \\ 56 \\ \hline 68 \overline{) 672} \end{array}$$

$$68 \overline{) 672} \quad 9 \text{ Hours.}$$

$$68 \overline{) 3600} \quad 52 \frac{64}{68} \text{ minutes.}$$

$$\begin{array}{r} 34 \\ 34 \\ \hline 68 \\ 68 \\ \hline 136 \\ 136 \\ \hline 272 \\ 272 \\ \hline 544 \\ 544 \\ \hline 1088 \\ 1088 \\ \hline 2176 \\ 2176 \\ \hline 2000 \\ 186 \\ \hline 1140 \\ 1140 \\ \hline 0 \end{array}$$

23. If a cannon may be discharged twice with 6 lb. of powder; how many times will 7 cwt. 3 qr. 17 lb. discharge the same piece? Ans. 295 times.

$$\begin{array}{r} \text{lb.} \quad \text{cwt qr lb} \\ 6 : 2 :: 7 \text{ cwt } 3 \text{ qr } 17 \text{ lb} \\ 4 \\ \hline 31 \\ 28 \\ \hline 255 \\ 63 \\ \hline 885 \\ 6 \overline{) 1770} \\ \hline 295 \text{ Ans.} \end{array}$$

24. What number is that. to which if you add $\frac{2}{3}$. the quotient will be 21? Ans. 15

24. What number is that. to which if you add $\frac{2}{3}$ of itself. the sum will be 20? Ans. 12.

$$\begin{array}{r} 6 \\ 3 \overline{) 12} \\ \hline 10 \\ 20 \\ \hline 18 \\ 30 \\ \hline 30 \\ 57 \overline{) 60} \\ \hline 12 \text{ Ans.} \end{array} \quad \begin{array}{r} 9 \\ 3 \overline{) 18} \\ \hline 15 \\ 20 \\ \hline 5 \\ 30 \\ \hline 30 \end{array}$$

25. What number is that. which being divided by $\frac{3}{4}$. the quotient will be 21? Ans. $15 \frac{3}{4}$.

$$\begin{array}{r} 21 \times 3 = 63 \\ 1 \times \frac{4}{4} = 4 \\ \hline 4 \overline{) 63} \\ \hline 15 \frac{3}{4} \text{ Ans} \end{array}$$

26. What number is that. which being multiplied by 15 the product will be $\frac{3}{4}$? Ans. $\frac{1}{20}$.

$$\begin{array}{r} 15 \times 3 = 45 \\ 1 \times \frac{1}{1} = 1 \\ \hline 45 \overline{) 3} \\ \hline 60 \\ 20 \text{ Ans.} \end{array}$$

27. What number is that. from which if you take $\frac{3}{5}$ the remainder will be $\frac{1}{10}$? Ans. $\frac{29}{10}$.

$$\begin{array}{r} 3 \\ 5 \overline{) 8} \\ \hline 15 \\ 29 \\ \hline 140 \text{ Ans.} \end{array}$$

28. What number is that whose half is equal to its square? Ans. 5.

$$\begin{array}{r} 7 \qquad 7 \\ 35 : 7 : 49 \\ 49 \overline{) 245} \cdot 5 \text{ Ans.} \\ 245 \end{array}$$

30. In what time will 500 dollars amount to 1000. at 6 per cent. per annum?

Ans. 16 years 8 months.

$$\begin{array}{r} 500 \text{ years } 1000 \\ 30.00 : 1 :: 500 \\ 30 \overline{) 500} \cdot 16 \text{ years.} \\ 480 \\ 200 \\ 180 \\ 202 \\ 30 \overline{) 240} \cdot 8 \text{ months.} \\ 240 \end{array}$$

29. A gentleman wishing to distribute some money among a number of children found he wanted 8 cents to give them 3 cents a piece. he therefore gave each 2 cents. and had three cents left: how many children were there? Ans. 11.

$$\begin{array}{r} 6 \qquad 6 \qquad 18 \qquad 18 \\ 2 \qquad 3 \qquad 2 \qquad 3 \\ 12 \qquad 18 \qquad 36 \qquad 54 \\ 3 \qquad 8 \qquad 3 \qquad 8 \\ 15 \qquad 10 \qquad 39 \qquad 46 \\ 10 \qquad 7 \qquad 39 \qquad 39 \\ 5 \qquad 12 \qquad 7 \qquad 6 \\ 18 \qquad 5 \qquad 42 \qquad 90 \\ 90 \text{ error } 7 \text{ error } 5 \\ 12 \qquad 12 \overline{) 132} \cdot 11 \text{ ans.} \end{array}$$

31. When $\frac{1}{2}$ of the members of congress were assembled + 15 there were $\frac{1}{3} + 10$ absent: how many members were in all? Ans. 150.

$$\begin{array}{r} \frac{1}{2} \quad 60 \quad \frac{1}{3} \quad 90 \quad \frac{1}{3} \\ 15+ \quad 30 \quad 15+ \quad 45 \quad 3 \\ 15+ \quad 15 \quad 15+ \quad 15 \quad 1 \\ 45 \quad 60 \quad 30 \quad 10 \\ 10 \quad 10 \quad 10 \quad 10 \\ 75 \quad 100 \quad 100 \quad 10 \\ 60 \quad 100 \quad 100 \quad 10 \\ 15 \quad 10 \quad 10 \quad 10 \\ 5 \end{array}$$

$$\begin{array}{r} 60 \quad 15 \\ 150 \quad 100 \\ 1350 \quad 600 \\ 1800 \quad 600 \\ 5 \overline{) 750} \cdot 150 \text{ Ans.} \\ 150 \end{array}$$

32. If the earth be 360 degrees round. each 69 $\frac{1}{2}$ miles: how long would it take a man to travel once around. at 20 miles a day. admitting there were no obstacles in the way. and reckoning 365 $\frac{1}{4}$ days in the year? Ans. 3 years 155 $\frac{1}{2}$ days.

$$\begin{array}{r} 360 \cdot 1 \\ 69 \cdot 5 \\ 25020 \\ 21600 \\ 20 \overline{) 25020} \cdot 1251 \text{ days.} \\ 1251 \cdot 25 \cdot 365 \cdot 25 \cdot 3 \text{ years.} \\ 109575 \\ 155 \cdot 25 \text{ days.} \end{array}$$

33. What is the mean time for paying 100 dollars at $3\frac{1}{4}$ months. 150 dolls. at $11\frac{1}{2}$ months. and 200 dolls. at $5\frac{3}{4}$ months? Ans. 11 months. $23\frac{134}{224}$ days.

$$\begin{array}{r} 100 \times 3.25 = 325 \\ 150 \times 11.5 = 1725 \\ 200 \times 5.75 = 1150 \\ \hline 450 \end{array}$$

$$\begin{array}{r} 450 \overline{) 2173} \text{ (11 months.)} \\ \underline{1816} \\ 3570 \\ \underline{10710} \text{ (23 134 Days)} \\ 1908 \\ \underline{1630} \\ 278 \\ \underline{224} \\ 54 \end{array}$$

34. If A can do a piece of work alone in 7 days. and B do the same in 12. how long will it require the m both toge ther? Ans. $4\frac{8}{19}$ Days.

$$\begin{array}{l} D W D \\ 7 : 1 :: 1 : \frac{1}{7} \\ 12 : 1 :: 1 : \frac{1}{12} \end{array}$$

$$\begin{array}{r} 1284 \\ 7 \times 1 = 7 \\ 7 \quad 12 \times 1 = 12 \\ \hline 19 \\ 84 \end{array}$$

$$\begin{array}{l} W D W \\ 19 : 1 :: 1 : \frac{1}{19} \end{array}$$

$$\begin{array}{r} 84 \\ 19 \overline{) 84} \text{ (4 8/19) Ans.} \\ \underline{76} \\ 8 \end{array}$$

$$\begin{array}{r} 12 \\ 7 : 12 :: 19 \\ 19 \overline{) 1284} \text{ (11 8/19) Ans.} \\ \underline{133} \\ 954 \\ \underline{954} \\ 0 \end{array}$$

35. A minor of 14 years of age has an annuity left him of 400 dolls; this sum his guardian agreed to receive yearly. and allow him compound interest at 5 per cent. thereon. till he should arrive at 21 years of age; how much must he then receive? Ans. 3256 dollars 80 cts.

$\begin{array}{r} 400 \\ 5 \overline{) 400} \\ \underline{200} \\ 200 \end{array}$	1	400
$\begin{array}{r} 400 \\ 5 \overline{) 400} \\ \underline{200} \\ 200 \end{array}$	2	400
$\begin{array}{r} 400 \\ 5 \overline{) 400} \\ \underline{200} \\ 200 \end{array}$	3	400
$\begin{array}{r} 400 \\ 5 \overline{) 400} \\ \underline{200} \\ 200 \end{array}$	4	400
$\begin{array}{r} 400 \\ 5 \overline{) 400} \\ \underline{200} \\ 200 \end{array}$	5	400
$\begin{array}{r} 400 \\ 5 \overline{) 400} \\ \underline{200} \\ 200 \end{array}$	6	400
$\begin{array}{r} 400 \\ 5 \overline{) 400} \\ \underline{200} \\ 200 \end{array}$	7	400

$$\begin{array}{r} 3256.80.33 \text{ Ans.} \end{array}$$

36. Sold goods to the amount of 100 dolls. for 11 months; what was the present worth. at 5 percent simple interest? Ans. 68.52 dolls.

Months
 $\frac{11}{12}$
 $12 \overline{) 20}$
 $\underline{12}$
 8
 100
 $\$ 101.6666 : 100 :: 100$
 $101.6666 \overline{) 100000.000000}$
 $\underline{6099996}$
 39000040
 $\underline{3133328}$
 76667120
 $\underline{3133328}$
 45333840
 $\underline{30833300}$
 145040
 $\underline{2033332}$
 (68.52 +
 Ans.

37. Three persons. A. B. and C. purchased a lot in partnership. for which A advanced $\frac{3}{7}$. B $\frac{2}{7}$. and C 110 dollars; what sum did A and B pay. and what part of the lot belonged to C?

Ans. { A paid 267 dolls. 27 + cts.
 { B paid 305 — 15 $\frac{1}{2}$ —
 and C had $\frac{11}{56}$ parts.

$\frac{3}{7} \frac{2}{7}$
 $\frac{6}{7}$
 $\frac{6}{7} \times 3 = 21$
 $67 \times 3 = 211$
 $\underline{115}$
 56
 Ans. 56 C
 $11 : 110 :: 21$
 $\underline{21}$
 560
 $\underline{280}$
 280
 $11 \overline{) 3360}$
 $\underline{33}$
 60
 $\underline{55}$
 50
 $\underline{50}$
 11
 Ans.

38. A gentleman finding several beggars at his door. gave to each four cents. and had sixteen left. but if he had given to each six cents. he would have wanted twelve; how many beggars were there? Ans. 14.

$\frac{10}{4}$	$\frac{10}{6}$	$\frac{12}{4}$	$\frac{12}{6}$
$\underline{40}$	$\underline{60}$	$\underline{48}$	$\underline{72}$
56	12	16	12
$\underline{48}$	18	64	60
8		11	

$10 \times 8 = 96$
 $12 \times 11 = 132$
 $\frac{11}{11} = 110$
 $\underline{156}$
 14
 Ans.

$11 : 110 :: 21$
 $\underline{21}$
 140
 $\underline{280}$
 $11 \overline{) 2940}$
 $\underline{22}$
 74
 $\underline{66}$
 80
 $\underline{77}$
 30
 $\underline{22}$
 80
 $\underline{77}$
 30
 Ans.

39. B. and C. can build a wall in 18 days. but with the assistance of A. they can do it in 11 days; in what time can A do it alone? Suppose the work to consist of 198 parts.
 Show $198 \div 18 = 11$ parts performed by B and C. in one day.
 Again. $198 \div 11 = 18$. performed by A. B. and C. in one day.
 But $18 - 11 = 7$ parts performed by A alone.

and A. 7 : 1 :: 198 : 28 3 25 $\frac{5}{7}$ Ans.

$$\begin{array}{r}
 7:1::192 \\
 1198 \overline{) 28} \text{ P} \\
 \underline{114} \\
 58 \\
 \underline{56} \\
 2 \\
 1198 \overline{) 3} \text{ H} \\
 \underline{1198} \\
 3025 \frac{5}{7} \\
 \underline{1198} \\
 1827 \\
 \underline{1827} \\
 0 \\
 \underline{0} \\
 0
 \end{array}$$

$$\begin{array}{r}
 \text{P } 28 \frac{3}{4} \text{ M} \\
 28 \cdot 3 \cdot 25 \frac{5}{7} \text{ Ans.}
 \end{array}$$

40. Twenty members of congress. 30 merchants. 24 lawyers. and 24 citizens. spent at a dinner 192 dollars, which sum was divided among them in such a manner that 4 members of congress paid as much as 5 merchants 10 merchants as much as 16 lawyers. and 8 lawyers as much as 12 citizens; the question is to know the sum of money paid by all the members of congress; also, by the merchants, lawyers, and citizens?

Ans. The 20 members of congress paid 60 dollars, the 30 merchants paid 72, the 24 lawyers paid 36, and the 24 citizens paid 24.

20 congress	Spent	$\frac{1}{4} = 5$
30 Merchants		$\frac{1}{3} = 6$
24 Lawyers		$\frac{1}{3} = 3$
24 Citizens		$\frac{1}{2} = 2$
		$\frac{16}{16}$

$$\begin{array}{r}
 \text{If } 16:192::5 \\
 16 \overline{) 192} \text{ the Congress} \\
 \underline{80} \\
 112 \\
 \underline{112} \\
 0
 \end{array}$$

$$\begin{array}{r}
 \text{If } 16:192::6 \\
 16 \overline{) 1152} \text{ Merchants} \\
 \underline{112} \\
 32 \\
 \underline{32} \\
 0
 \end{array}$$

$$\begin{array}{r}
 \text{If } 16:192::3 \\
 16 \overline{) 576} \text{ Lawyers} \\
 \underline{48} \\
 96 \\
 \underline{96} \\
 0
 \end{array}$$

$$\begin{array}{r}
 \text{If } 16:192::2 \\
 16 \overline{) 384} \text{ Citizens} \\
 \underline{32} \\
 64 \\
 \underline{64} \\
 0
 \end{array}$$

41. What difference is there between a piece of ground 28 perches long by 20 broad, and two others each of half those dimensions?

Ans. 1 acre 39 qrs.

$$\begin{array}{r}
 28 \\
 20 \\
 \hline
 2 \overline{) 560} \\
 160 \overline{) 280} \text{ 1 acre.} \\
 \underline{160} \\
 120 \\
 40 \overline{) 120} \text{ 3 qrs.} \\
 \underline{120} \\
 0
 \end{array}$$

42 Required the dimensions of a parallelogram containing 200 acres, which is 40 perches longer than wide? Ans. 200 perches by 160.

$$\begin{array}{r}
 40 \\
 160 \overline{) 3200} \text{ 20} \\
 \underline{320} \\
 0
 \end{array}$$

$$\begin{array}{r}
 20:3200::200 \\
 200 \\
 20 \overline{) 64000} \\
 160 \overline{) 32000} \text{ 200.} \\
 \underline{320} \\
 00
 \end{array}$$

Ans. 14 acres 2 qrs. 11 per

$$\begin{array}{r} 30 \\ 30 \\ \hline 900 \\ 900 \\ \hline 1800 \end{array} \quad \begin{array}{r} 12.4 \\ 30 \\ \hline 12.4 \end{array}$$

$$\begin{array}{r} 8.2 \overline{) 200} \\ \underline{164} \\ 3600 \\ \underline{3346} \end{array}$$

$$12.4:30 :: 20$$
$$\begin{array}{r} 20 \\ 12.4 \overline{) 600.0} (48.3 \\ \underline{496} \\ 1040 \\ \underline{992} \\ 480 \\ \underline{372} \\ 108 \end{array}$$
$$\begin{array}{r} 48.3 \\ 48.3 \\ \hline 144.9 \\ 3864 \\ \hline 1932 \\ \hline 40) 2332.89 \\ 4) 58 : 1 \\ \hline 144.2 \dots 12 \text{ Ans.} \end{array}$$

26514: 73028::88

$$\begin{array}{r}
 36514 \\
 292112 \\
 53028 \\
 365140 \\
 438168 \\
 219084 \\
 \hline
 88.000000 \overline{) 2666.544392} (30.301 \\
 \underline{264000000} \\
 265443920 \\
 \underline{264000000} \\
 144392000 \\
 \underline{880000000} \\
 55392000
 \end{array}$$

111. The paving of a triangular yard at 18d. per foot, came to 100l; the longest of the three sides was 88 feet; what then was the sum of the other two equal sides? Ans. 106.85 feet.

$$18 : 1 :: 100$$
$$\begin{array}{r} 2000 \\ 18 \overline{) 24000} \end{array} \quad (1333.333$$

$1333.3330(36.514$
 $\underline{9}$
 73.028
 $6.6) 433$
 $\underline{396}$
 $72.5) 3733$
 $\underline{3625}$
 $730.1) 10730$
 $\underline{7301}$
 $7301.4) 342900$
 $\underline{292056}$
 50844

$$\begin{array}{r}
 44 \\
 44 \\
 \hline
 176 \\
 176 \\
 \hline
 7936
 \end{array}$$

$$\begin{array}{r}
 30301 \\
 30301 \\
 \hline
 30301 \\
 909030 \\
 \hline
 909030 \\
 918150601 \\
 \hline
 1936 \\
 2854.150601(53424 \\
 \hline
 25 \\
 106.818 \text{ Ans.}
 \end{array}$$

$$\begin{array}{r}
 10.3 \overline{) 354} \\
 309 \\
 \hline
 4515 \\
 106.4 \overline{) 4515} \\
 4256 \\
 \hline
 25906 \\
 1068.2 \overline{) 25906} \\
 21362 \\
 \hline
 454401 \\
 424346 \\
 \hline
 37025
 \end{array}$$

115. Required the length of a line by which a circle that shall contain Just half an acre may be laid off? Ans. $27\frac{3}{4}$ yards.

$$\begin{array}{r} 2) 160 \\ 80 \end{array} \begin{array}{r} 8.94 \\ 64 \\ 16.9 \end{array} \begin{array}{r} 1600 \\ 1521 \\ 178.4 \end{array} \begin{array}{r} 7900 \\ 7176 \end{array}$$

$$\begin{array}{r} 1.12837 \\ 8.94 \\ 451348 \\ 1015533 \\ 902696 \\ 10.0876278 \\ 504381390 \\ 501138139 \\ 2554819529 \\ 27.7401176 \end{array} \text{ Ans.}$$

116. A ceiling contains 114 yards 6 feet of plastering and the room is 28 feet broad; what is its length? Ans. $36\frac{6}{7}$ feet

$$\begin{array}{r} 114:6 \\ 28) 1032 \end{array} \begin{array}{r} 36\frac{6}{7} \end{array} \text{ Ans.}$$

118. If 20 feet of iron railing weigh half a ton. when the bars are an inch and a quarter square. what will 50 feet come to at $3\frac{1}{2}$ d. per pound. the bars being but $\frac{7}{8}$ of an inch square? Ans. 206.05.20.

$$\begin{array}{r} 20\frac{1}{4} \\ 20 \\ 25\frac{1}{4} \\ 2\frac{5}{8} \text{ Cwt} \\ 3.125:10::38.28125 \end{array} \begin{array}{r} 50 \\ 8) 350 \\ 113.75 \\ 30625 \\ 38.28125 \\ 10 \text{ Cwt} \\ 31.25000) 38.281250 \\ 31.25000 \\ 7.031250 \\ 6.250000 \\ 7.812500 \\ 6.250000 \\ 1.5625000 \\ 1.5625000 \end{array}$$

117. A common Joist is 7 inches deep and $2\frac{1}{2}$ thick. but I want another just as big again. that shall be three inches thick; what must be its other dimension? Ans. $11\frac{2}{3}$ inches.

$$\begin{array}{r} 7 \\ 2\frac{1}{2} \\ 14 \\ 3.5 \\ 17.5 \\ 3) 35.0 \\ 11\frac{2}{3} \end{array} \text{ Ans.}$$

$$\begin{array}{r} 1: 3\frac{1}{2} :: 12.25 \\ 49.00 \\ 28 \\ 392 \\ 392 \\ 1372\frac{1}{2} \\ 4116 \\ 686 \\ 12) 11802 \\ 20) 11000 \end{array} \begin{array}{r} 2 \\ 2000 \end{array} \text{ Ans.}$$

119. A may-pole. whose top being broke off by a blast of wine. struck the ground at 15 feet distance from the foot of the pole; what was its whole height. supposing the length of the broken piece to be 39 feet? Ans. 75 feet.

$$\begin{array}{r}
 15 \\
 15 \\
 \hline
 225
 \end{array}
 \qquad
 \begin{array}{r}
 39 \\
 39 \\
 \hline
 117 \\
 1521 \\
 \hline
 1296
 \end{array}
 \begin{array}{r}
 39 \\
 36 \\
 \hline
 75
 \end{array}
 \text{Ans}$$

$$6.6) 396$$

$$\begin{array}{r}
 500 \\
 250 \\
 \hline
 250 \\
 550
 \end{array}$$

$$\begin{array}{r}
 24 \\
 216 \\
 \hline
 216 \\
 3) 24 \\
 \hline
 8 \\
 64 \\
 \hline
 5) 60 \\
 \hline
 12 \\
 96 \\
 \hline
 103
 \end{array}
 \text{Ans.}$$

50. Required a number: from which, if 7 be subtracted, and the remainder be divided by 8, and the quotient be multiplied by 5, and 11 added to the product, the square root of the sum extracted, and three-fourths of that root cubed, the cube divided by 9, the last quotient may be 24?

Ans. 103.

$$\begin{array}{r}
 103 \\
 4 \\
 \hline
 8) 96 \\
 \hline
 12 \\
 60 \\
 \hline
 64 \\
 64 \\
 \hline
 11) 24 \\
 \hline
 6 \\
 36 \\
 \hline
 9) 216 \\
 \hline
 24
 \end{array}
 \text{proof}$$

51. A vintner has a cask of wine containing 500 galls. of which he draws 50 galls. and fills it up with water, and repeats the same thing five times; I demand what quantity of wine, and also of water, is then in the cask?

Ans. 295 galls. 1 qt. of wine, and 204 galls. 3 qts. of water nearly.

Wine

$$\begin{array}{r}
 500 \\
 50 \\
 \hline
 450 \\
 45 \\
 \hline
 405 \\
 40 \\
 \hline
 364.2
 \end{array}$$

Water

$$\begin{array}{r}
 50 \\
 50 \\
 \hline
 100 \\
 50 \\
 \hline
 150 \\
 95 \\
 \hline
 245 \\
 50 \\
 \hline
 295
 \end{array}$$

$$500:50::450$$

$$500) 22500$$

$$45$$

$$500:50::405$$

$$500) 20250$$

$$40.5$$

$$\begin{array}{r}
 50 \\
 36.1111 \dots 2\frac{2}{5} \\
 \hline
 13.2222 \dots 1\frac{3}{5}
 \end{array}$$

$$\begin{array}{r}
 500:50::364.2 \\
 2000 \quad 14580 \\
 2000) 72900 (36\frac{1}{2} \\
 \hline
 12900 \\
 12000 \\
 \hline
 900 \\
 2000) 3600 (12\frac{1}{2} \\
 \hline
 1600 \\
 2000) 2200 (11 \\
 \hline
 1200 \\
 2000) 4800 (2\frac{1}{2} \text{ gills} \\
 \hline
 4000 \\
 1) 800 = 2 \\
 1) 2000 = 5
 \end{array}$$

$$\begin{array}{r}
 250 \\
 1000 \\
 \hline
 1000
 \end{array}$$

225

g qt pt gils
 364 2 0 0
 328 0 0 1
 32 3 0 1
 295 0 1 3
 204 3 0 0
 500 0 0 0
 Wine
 Water
 Ans.

3 19
 55 25
 1 5
 5) 25
 5x3=15
 1x19=19
 21
 25

2 6
 5) 25
 5x2=10
 1x6=6
 14
 25

52. Since a pile of
 wood 11 feet long, 11 feet
 high, and 8 feet broad,
 makes a cord, what part
 of cord will be in a pile
 of half the dimensions ea
 ch way? Ans. $\frac{1}{8}$ part.

2
 2
 4
 16
 128 = 8
 Ans.

g qr pt gils
 35 2 0 0
 13 2 0 1
 121 3 1 2
 50 3 1 2
 171 3 1 2
 14 0 1 2
 154 3 0 0
 50 3 0 0
 204 3 0 0
 Water

g g g gr pt gils
 500: 50 :: 328 0 0 1
 2000 2
 1000 1
 16000 5
 80000 5
 52488 50

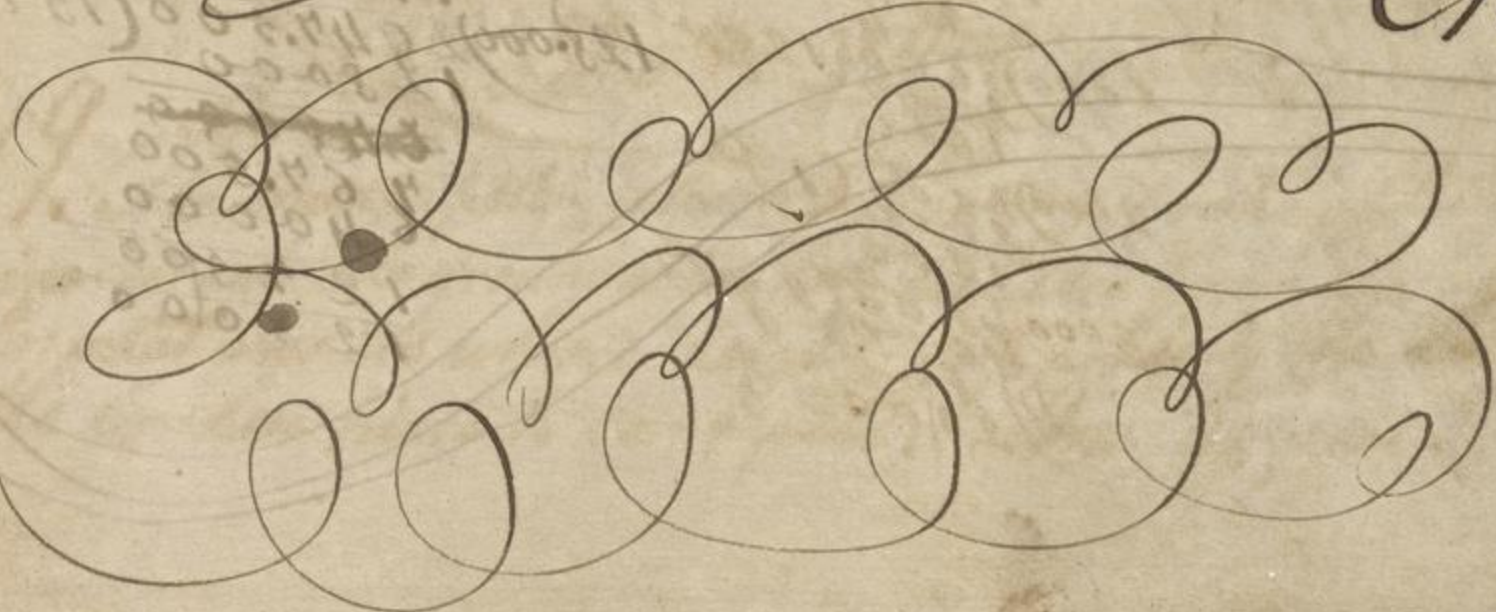
80000) 2624400 (32 g
 2624400
 240000
 224400
 160000
 64400

80000) 254600 (3 qt
 240000
 14600

140800 (1 gils
 80000
 60800 = 19
 32) 60800 = 25

32 3 0 1
 17 0 1 2
 25

James McCormick



53. Owed B 1864 dollars. for which he gave his note. on interest. bearing date April 1st. 1817. On the back of the note are the following endorsements. viz.

Oct. 15th. 1817. Received in cash 225 dolls. 50cts.

Jan. 10th. 1818. Received in cash 150—

Same date. one bag of coffee: weight 1 cwt. 22 lb. at 29 cts per pound

May 16th. Received 3 ton of iron at 195 dolls. per ton.

What is the sum due from A to B, on the 1st of August. 1818?

$$\begin{array}{r}
 1864 \\
 195 \\
 \hline
 3320 \\
 16776 \\
 \hline
 1864 \\
 60) 363480 \\
 \underline{60.58} \\
 1699.08 \\
 85 \\
 \hline
 849540 \\
 1359264 \\
 60) 14442180 \\
 \underline{24.07.03}
 \end{array}$$

$$\begin{array}{r}
 1534.2903 \\
 126 \\
 \hline
 92057418 \\
 184114836 \\
 60) 1933205778 \\
 \underline{32.22.0096}
 \end{array}$$

$$\begin{array}{r}
 D \quad C \\
 18.64.00 \text{ principal} \\
 60.58 \text{ interest} \\
 \hline
 1924.58 \text{ amount} \\
 225.50 \text{ Receipt} \\
 \hline
 1699.08 \text{ second principal} \\
 24.07 \text{ sec interest} \\
 \hline
 1723.15 \text{ amount} \\
 188.86 \text{ Receipt} \\
 \hline
 1534.29 \text{ third pri} \\
 32.22 \text{ inter} \\
 \hline
 1566.51 \text{ amount} \\
 555.00 \text{ Receipt} \\
 \hline
 1011.51 \text{ fourth pri} \\
 12.117.5 \text{ interest} \\
 \hline
 1023.98.5 \text{ Ans.}
 \end{array}$$

$$\begin{array}{r}
 195 \\
 555 \\
 \hline
 120.22 \\
 4 \\
 \hline
 28 \\
 134 \\
 \hline
 24 cts \\
 1206 \\
 268 \\
 \hline
 38.86 \\
 150 \\
 \hline
 188.86
 \end{array}$$

$$\begin{array}{r}
 101151 \\
 74 \\
 \hline
 404604 \\
 708057 \\
 60) 7485174 \\
 \underline{12.117.5}
 \end{array}$$

54. How many cords are there in a pile of wood 36 feet long. 6 1/2 feet wide. and 8 3/4 feet high?

$$\begin{array}{r}
 8.75 \\
 6.5 \\
 \hline
 43.75 \\
 5250 \\
 \hline
 56875 \\
 36 \\
 \hline
 341250 \\
 170625 \\
 128000 \\
 128000 \\
 \hline
 2047500 \\
 128000 \\
 \hline
 2175500 \\
 640000 \\
 \hline
 1245000 \\
 1280000 \\
 \hline
 1280000
 \end{array}$$

128.000) 2047500 (15 Ans.

55. If a man spends 356 dolls
34 cents per year. how much wi
ll it be per day?

Days 365
365)356.34(97 Ans.
3295
2784
2555
229
365

57. If 8 men spend 20 dollars 50
cents in 3 days. how long will 64
men be in spending 100 dollars at
the same rate?

20.50 : 30 :: 64
64
8200
12300
131200
131200)24000000(18 12/41 Ans.
131200
1088000
1049600
384000 = 12/41
32)131200 = 12/41

56. A bankrupt. whose whole
property is worth 2564 dolls. 95 1/2
cents. can pay his creditors but
18 3/4 cents on a dollar; how much
does he owe?

18.75 : 1 :: 2564.95.50
1875)2564.95.50(13679 + Ans.
1875
6899
5625
12745
11250
1495
13125
18300
16875
1425

58. A bridge built
over a stream in 6 months
by 34 men, being wash
ed away by a flood. how
long time will it take 86
men to build another in its place
of twice as much work?

months days 34 } mon 86
11 22+ } : 6 :: 2 Work
86 34
68
86)1108 11 mon
344
64 days
30
86)1920(22+
172
200
172
28

59. Three gardeners. A. B and C.
having bought a piece of ground. find the
profits of it to amount to 240 dolls. a year: now
the sum of money which they gave. was in such propor
tion. that as often as A paid 5 dolls. B paid 7, and as often
as B paid 11 dolls. C paid 6; how much must each man receive for
his share of the profits per annum?

128 5x4=20 A
7 7x4 28 B
6x7 42 C
90:20::240
20
90)4800
A 53.33 2/3
90:28::240
240
1120
56
90)6720
B 74.66 2/3
90:42::240
240
1680
84
90)10080
11200 C
74.66 2/3
53.33 2/3
240.00 Proof

60. If a county tax of 7 cents and 3 mills is assessed on property. how much must that man pay whose property is valued at \$564 dollars 20 cents?

$$\begin{array}{r} 6 \text{ Cms } 7.3 \text{ P.C.} \\ 100 : 7.3 :: 564.20 \\ \hline 2569260 \\ 5994910 \\ \hline 100) 62518660 \text{ Ans.} \end{array}$$

61. Suppose a cistern having a pipe which conveys 11 gallons 2 quarts into it in an hour. and ~~the~~ has another that lets out 2 gallons 2 quarts and 1 pint in an hour: in what time will it be filled. allowing it to contain $8\frac{1}{2}$ gallons?

$$\begin{array}{r} \text{G} \quad \text{qt} \quad \text{pt} \\ 11 \quad 2 \quad 0 \\ 2 \quad 2 \quad 1 \\ \hline 1 \quad 3 \quad 1 : 1 :: 8\frac{1}{2} \\ \hline 15 \quad 338 \quad 76 \text{ M } \text{Ans.} \\ 15) 676 \quad 45.4 \text{ Ans.} \\ \hline 46 \\ 60 \text{ mi} \\ 60 \end{array}$$

62. What is the length of a lane. which being 36 feet wide. that will contain just one acre of ground?

$$\begin{array}{r} 160 \\ 160 \\ 960 \\ 160 \\ 8 \\ 36) 2640 \quad 73\frac{1}{3} \text{ Ans.} \\ \hline 252 \\ 120 \\ 120 \\ 12) 120 \end{array}$$

$$\begin{array}{r} 73\frac{1}{3} \\ 36 \\ \hline 438 \\ 219 \\ \hline 2640 \text{ proof} \end{array}$$

63. If 50 men consume 12 bushels of grain in 30 days. how much will 40 men consume in 90 days?

$$\begin{array}{r} \text{men } 50 \\ \text{Days } 30 \\ \hline 1500 \end{array} : 12 :: \begin{array}{r} 40 \text{ men} \\ 90 \text{ Days} \\ \hline 3600 \end{array}$$

$$\begin{array}{r} 1500) 3600 \\ \hline 3000 \\ 6000 \\ 13200 \\ 12000 \\ \hline 12000 \\ 3) 15000 \end{array}$$

64. A gentleman had 18 dollars 90 cents to pay among his laborers; to every boy he gave 6 cents. to every woman 8 cents. and to every man 16 cents; now there were three women for every boy. and two men for every woman; required the number of each?

$$\begin{array}{l} 3 \times 6 = 18 \text{ B} \\ 9 \times 8 = 72 \text{ W} \\ 18 \times 16 = 288 \text{ M} \end{array}$$

$$\begin{array}{r} 378 : 3 :: 18.90 \\ 378) 5670 \\ \hline 378 \\ 1890 \end{array}$$

15 Boys
45 Women
90 Men

Proof

$$\begin{array}{l} B 15 \times 6 = 90 \\ W 45 \times 8 = 360 \\ M 90 \times 16 = 1440 \\ \hline 1890 \text{ proof} \end{array}$$

65. Two men depart from the same place and travel the same way; the one travels at the rate of 3 miles an hour, for 8 hours every day. the other goes at the rate of $4\frac{1}{2}$ miles. for 4 hours each day; how far are they apart at the end of 13 days?

$$\begin{array}{r} 76 \\ 8 \\ 3 \\ 24 \\ 13 \\ 42 \\ 24 \\ \hline 312 \end{array}$$

$$\begin{array}{r} 76 \\ 4\frac{1}{2} \\ 28 \\ 3.5 \\ 31.5 \\ 13 \\ 94.5 \\ 31.5 \\ 409.5 \\ 312 \\ \hline 94.5 \text{ m} \end{array}$$

Ans.

66. A began to trade on the 1st of January. with a capital of 962 dollars: on the 15th of April following. he took in B as a partner. with 1635 dollars: on the 1st of July. A put in 320 dollars more. and 1 month after B drew out $\frac{1}{5}$ of his capital; on the last day of December. on settling their accounts. they found a gain of 486 dollars 64 cents; what was each partner's share?

$$962 \times 12 = 11544$$

$$320 \times 6 = 1920$$

$$1635 \times 8\frac{1}{2} = 13897.5$$

$$408.75 \times 5 = 2043.75$$

$$\begin{array}{r} 13464 \\ 11853.75 \\ \hline 25317.75 \end{array}$$

$$\begin{array}{r} 11853.75 \\ 11853.75 \end{array}$$

$$25317.75 : 486.64 :: 13464 : 258.79$$

$$\begin{array}{r} 13464 \\ 486.64 \\ \hline 5385600 \\ 80184 \\ 80784 \\ 107712 \\ 53856 \\ \hline 6552120.9600 \\ 5063550 \\ \hline 14885709 \\ 12658875 \\ \hline 22268346 \\ 20254200 \\ \hline 20141460 \\ 17422425 \\ \hline 25190250 \\ 22785975 \end{array}$$

$$25317.75 : 486.64 :: 11853.75 : 2278.45$$

$$\begin{array}{r} 11853.75 \\ 486.64 \\ \hline 4741500 \\ 7112250 \\ 7112250 \\ 9483000 \\ 4741500 \\ \hline 5768508.9000 \\ 5063550 \\ \hline 7049589 \\ 5063550 \\ \hline 19860390 \\ 14422425 \\ \hline 21379650 \\ 20254200 \\ \hline 11254500 \\ 10127100 \end{array}$$

$$B 227.84$$

$$A 258.79$$

$$486.63$$

67. Suppose the Ohio river to be 2500 feet wide. 6 feet deep. and runs at the rate of 3 miles an hour: in what time will it fill a cistern of two miles in length. breadth and depth. the mile being 5280 feet?

Proof

$$\begin{array}{r} 2500 \times 6 \times 5280 = 7920000 \text{ cu ft} \\ 3 \text{ miles} = 15840 \text{ ft} \\ 15840 \times 15840 \times 6 = 15196800 \text{ cu ft} \\ 7920000 \div 15196800 = 0.5218 \text{ hours} \\ 0.5218 \times 60 = 31.31 \text{ minutes} \end{array}$$

$$\begin{array}{r}
 5280 \\
 15840 \\
 \hline
 15000 \\
 49200000 \\
 15840 \\
 \hline
 237600000
 \end{array}$$

$$\begin{array}{r}
 1760 \\
 5280 \\
 \hline
 10560 \\
 10560 \\
 \hline
 633600 \\
 528000 \\
 \hline
 105600 \\
 1115136000 \\
 \hline
 6690816000 \\
 554568000 \\
 \hline
 1115136000
 \end{array}$$

$$\begin{array}{r}
 2500 \\
 15000
 \end{array}$$

ft. $237600000 : 1 :: 1115136000$ $4956.9.36$ Ans. H.M.Sc.

$$\begin{array}{r}
 144583616000 \\
 9504000000 \\
 \hline
 227183616000 \\
 21384000000 \\
 \hline
 133143616000 \\
 11880000000 \\
 \hline
 146361600000 \\
 142560000000 \\
 \hline
 38016000000 \\
 27809600000 \\
 \hline
 213840000000 \\
 142560000000 \\
 \hline
 85536000000 \\
 41280000000 \\
 \hline
 142560000000 \\
 142560000000
 \end{array}$$

9M 36 Sc

68. A sloth was observed climbing a tree at the rate of $9\frac{1}{2}$ inches every day, but during the night slipped down $6\frac{3}{4}$ inches; how long will it be in reaching a limb 115 feet 6 inches from the ground?

$$\begin{array}{r}
 \text{ft} \\
 9\frac{1}{2} \\
 6\frac{3}{4} \\
 \hline
 2\frac{1}{4} \text{ ft} \\
 11 : 1 ::
 \end{array}$$

$$\begin{array}{r}
 \text{ft} \\
 115 \\
 9\frac{1}{2} \\
 \hline
 35\frac{1}{2} \\
 112 \\
 \hline
 11142 \\
 11 \\
 \hline
 32 \\
 19 \\
 \hline
 11
 \end{array}$$

12 19 13 11 Ans.

69. In an orchard of fruit trees, $\frac{1}{2}$ of them bear apples, $\frac{1}{3}$ peaches, $\frac{1}{4}$ cherries, & plums, and 116 are pear: how many trees does the orchard contain?

$$\begin{array}{r}
 360 \\
 46 \\
 \hline
 2160 \\
 1440 \\
 \hline
 2316560 \\
 21720 \text{ ans} \\
 360 \\
 144 \\
 \hline
 190 \\
 46 \\
 \hline
 2360
 \end{array}$$

Prod 1720 proof

$$\begin{array}{r}
 2) 11111 \\
 1549 \\
 \hline
 29 \\
 189 \\
 \hline
 2360 \\
 180 \\
 \hline
 542 \\
 8945 \\
 \hline
 337 \\
 360 \\
 \hline
 23 \\
 360
 \end{array}$$

70. An old soldier lately received a sum of money as a pension from government: of this sum he paid 94 dollars in the payment of debts which he then owed. half of what remained he lent to a friend. and a fifth he gave for a suit of cloths: he then found that nine-tenths of his money was gone; what sum did he at first receive?

$$\begin{array}{r} 100 \\ 94 \\ \hline 2) 306 \\ \hline 3) 153 \\ \hline 61.2 \\ 94 \\ \hline 308.2 \end{array}$$

$$\begin{array}{r} 100 \\ 94 \\ \hline 3600 \\ 3082 \\ \hline 518 \end{array}$$

$$\begin{array}{r} 600 \\ 94 \\ \hline 2) 506 \\ \hline 3) 253 \\ \hline 101.2 \\ 94 \\ \hline 1118.2 \end{array}$$

$$\begin{array}{r} 600 \\ 94 \\ \hline 5400 \\ 4482 \\ \hline 918 \\ 94 \\ \hline 51.8 \\ 100 \end{array}$$

1st Error 51800
2nd Suppos 310800

918 Second Error
100 first Suppos
367200
310800
100) 56140
1111 Ans

$$\begin{array}{r} 111 \\ 94 \\ \hline 2) 117 \\ \hline 3) 23.5 \\ \hline 94 \\ \hline 126.9 \end{array}$$

$$\begin{array}{r} 111 \\ 94 \\ \hline 10) 1269 \\ \hline 126.9 \text{ proof} \end{array}$$

71. What number is that, of which the difference be taken its third and fourth parts is 84?

$$\begin{array}{r} 3) 150 \\ \hline 50 \\ 37.5 \end{array}$$

$$12.5 : 150 :: 84$$

$$\begin{array}{r} 150 \\ 1200 \\ 84 \\ \hline 12.5) 12600.0 (1008 \text{ Ans} \\ \hline 125 \\ 1000 \\ 10000 \\ 336 \\ 252 \\ \hline \text{proof } 84 \end{array}$$

$$\begin{array}{r} 3.1416 \\ 16 \\ \hline 188496 \\ 31416 \\ \hline 2) 50.2656 \text{ Circum of } S \\ \hline 25.1328 \end{array}$$

$$\begin{array}{r} 3.1416 \\ 24 \\ \hline 125664 \\ 62832 \\ \hline 3) 75.3984 \text{ Circum of } L \\ \hline 25.1328 \end{array}$$

72. In turning a chaise within a circle of a certain diameter. it was discovered that ~~that~~ the outer wheel turned thrice. while the inner turned twice: now supposing the axle tree 11 feet long. and the wheels of an equal size. the length of the circumference described by each wheel is required?

$$\begin{array}{r} 3.1416 \\ 24 \\ \hline 125664 \\ 62832 \end{array}$$

$$\begin{array}{r} 3) 75.3984 \text{ Circum of } L \\ \hline 25.1328 \end{array}$$

$$\begin{array}{r} 3) 180 \\ \hline 60 \\ 40 \\ \hline 15 : 180 : 84 \\ 15) 1512 \\ \hline 1008 \\ 15120 \end{array}$$

$$\begin{array}{r} 24 \\ 11 \\ \hline 1 : 1512 \\ 5464 \\ \hline 11) 2184 \\ \hline 198 \end{array}$$

73. The sum of the sides of an equilateral triangle is 125 feet;
required the area thereof?



$$\begin{array}{r}
 125 \\
 125 \\
 \hline
 625 \\
 250 \\
 125 \\
 \hline
 15425 \\
 3906.25 \\
 \hline
 17519.75
 \end{array}$$

$$\begin{array}{r}
 625 \\
 3125 \\
 1250 \\
 3450 \\
 \hline
 3906.25
 \end{array}$$

107.32 root of the difference of the squares

$$\begin{array}{r}
 20.7) 1519 \\
 \underline{1449} \\
 7005 \\
 214.3) 6429 \\
 \underline{6429} \\
 59600 \\
 2146.2) 42924 \\
 \underline{42924} \\
 16676
 \end{array}$$

$$\begin{array}{r}
 53.66 \\
 125 \\
 \hline
 26830 \\
 10732 \\
 5366 \\
 \hline
 6707.50
 \end{array}$$

Ans.

James M. Cornick
His Book. 1822

James Mc Cormick His Book

LCY P

$$\begin{array}{r} 7 \overline{) 25 \dots 16 \dots 9 \frac{25}{63}} \\ 3 \dots 13 \dots 9 \frac{1103}{7111} \\ \hline 25 \dots 16 \dots 9 \frac{25}{63} \end{array}$$

Ans
Proof

$$\begin{array}{r} \frac{1103}{1111} \times \frac{1}{7} \\ \hline 2821 \quad (6 \frac{25}{63}) \\ 2646 \\ \hline 175 = 25 \\ 7 \overline{) 1111 = 63} \end{array}$$

Rule for Dividing
Divide the whole numbers
as usual and what is over
multiply the Denominator
with it and add in the numer-
ator. for a new denominator
numerator and multiply the
Denominator with the Divisor
for a new Denominator

Divide 20 lb of beef between
A B and C give A $\frac{1}{3}$ B $\frac{1}{4}$ and C $\frac{1}{5}$

$$\begin{array}{l} \frac{3}{4} \\ \frac{12}{5} \\ \frac{1}{3} \overline{) 60} = 20 \\ \frac{1}{4} \overline{) 60} = 15 \\ \frac{1}{5} \overline{) 60} = 12 \end{array}$$

$$47:20::20$$

$$\begin{array}{r} 20 \\ 47 \overline{) 400} (8 \frac{24}{47}) \\ 376 \\ \hline 24 \\ 47 \end{array}$$

$$47:20::15$$

$$\begin{array}{r} 20 \\ 47 \overline{) 300} (6 \frac{18}{47}) \\ 282 \\ \hline 18 \\ 47 \end{array}$$

$$47:20::12$$

$$\begin{array}{r} 20 \\ 47 \overline{) 240} (5 \frac{5}{47}) \\ 235 \\ \hline 5 \\ 47 \end{array}$$

$$\begin{array}{l} A \quad 8 \frac{24}{47} \\ B \quad 6 \frac{18}{47} \\ C \quad 5 \frac{5}{47} \end{array}$$

James M

$$\begin{array}{r} 20 \frac{111}{47} \\ 16 \overline{) 111} \end{array}$$

Proof

$$\frac{1}{3} \times \frac{1}{4} \times \frac{1}{5} = \frac{1}{60}$$

$$\begin{array}{l} \frac{1}{3} \overline{) 60} \\ \frac{1}{4} \overline{) 20} \\ \frac{1}{5} \overline{) 15} \\ \frac{1}{60} \overline{) 12} \end{array}$$

$$47:20::\frac{1}{3}$$

$$\begin{array}{r} 20 \\ 141 \overline{) 1200} (8 \frac{24}{141}) \\ 1128 \\ \hline 72 = 24 \\ 3 \overline{) 141} = 47 \end{array}$$

Ans

James
Freeman

James

Georges Township. January 20 - 1825

20	Noble McCormick dr to one days work breaking flax at 33 1/2 cts per day	33 1/2
	Noble McCormick dr to one and a half Days work Coping sawlogs	1 1/2
	Noble McCormick dr to Three days and a halfs worth tramping out wheat and cleaning up and going to mill	3 1/2
	Noble McCormick dr to one days work breaking flax	1
	Noble McCormick dr to four Days work halling sawlogs	4
	Noble McCormick dr to one days work halling rails	1
	Noble McCormick dr to three days work ^{limb} halling of ston and one days work making a waggon tree and halling ston	4
	Noble McCormick dr to two days work halling rails and capful poles and a half a days work going to mill	2 1/2 17 1/2 Cts

To

James M. Cormick *Wm. Good*
CORNELL

10 Gallons one and a half or two and
a half for 20 fifty sent bucket full
one and a half Two pints and a half

Received of Mr James M. Cormi
one dollar & forty two cents the
balance in full of his account

1.42 3 2nd March 1826 Joshua Ward

What Divisor true to 6 Decimal places will produce the same result as if multiplied by 222

.222/1.000 (0.004504 the true Divisor Answer

$$\begin{array}{r}
 .222 \overline{) 1.000} \\
 \underline{888} \\
 1120 \\
 \underline{1110} \\
 1000 \\
 \underline{888} \\
 1120 \\
 \underline{1110} \\
 1000 \\
 \underline{888} \\
 1120
 \end{array}$$

$$\begin{array}{r}
 .004504 \overline{) 1.000000} \\
 \underline{9008} \\
 9920 \\
 \underline{9008} \\
 9220 \\
 \underline{9008} \\
 1120
 \end{array}$$

Proof

$$\begin{array}{r}
 1.000 \\
 \times .222 \\
 \hline
 222.000
 \end{array}$$

To find the Solidity of a cannon ball whose circumference is 42 inches

Circumference is as 3.14 : to 1 Diameter

As 3.14 : 1 :: 12

$$\begin{array}{r}
 3.14 \overline{) 12.00} \\
 \underline{942} \\
 2580 \\
 \underline{2512} \\
 6800 \\
 \underline{628}
 \end{array}$$

3.82 Diameter

$$\begin{array}{r}
 12 \text{ inches} \\
 \times 3.82 \\
 \hline
 45.84
 \end{array}$$

$$\begin{array}{r}
 45.84 \\
 \times .636 \\
 \hline
 27504 \\
 14752 \\
 27504 \\
 \hline
 2925424
 \end{array}$$

Answer - 29.25424 inches of the ball

			3		
		2	7	6	
	1	9	5	1	9
		4	3	8	
			7		

1	2	5	7	6
9	5	1		
4	3	8		

22

000

00

infu

Cal

Dis Pepsay Redison

Colombo 31 ¹/₂ Mix { take a large tea spoon full
Magnesia alba 31 ¹/₂ them } every morning Noon & evening a
half hour after eating in a little
water

9258
9008
112

1.000

.222

222.000

To find the Solidity of a Cannon Ball whose circumf
is 12 Inches

Circumf is as 3.14 : to 1 Diameter

As 3.14 : 1 :: 12

(6)

3.14) 12.00 (3.82 Diameter

942
2580
2512
668
628

.636

12 Inches

3.82

45.84
.636

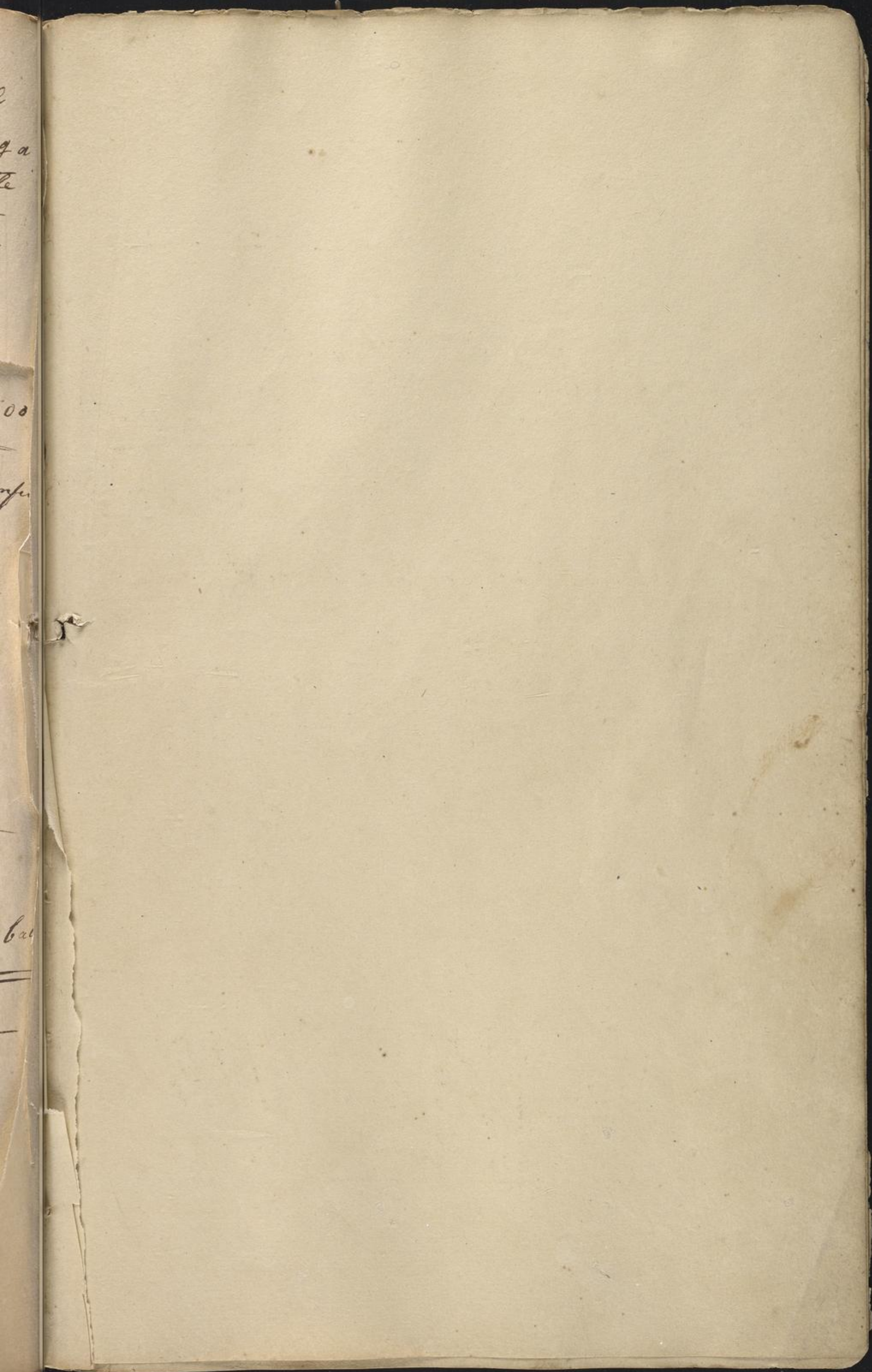
27504
14752
27504

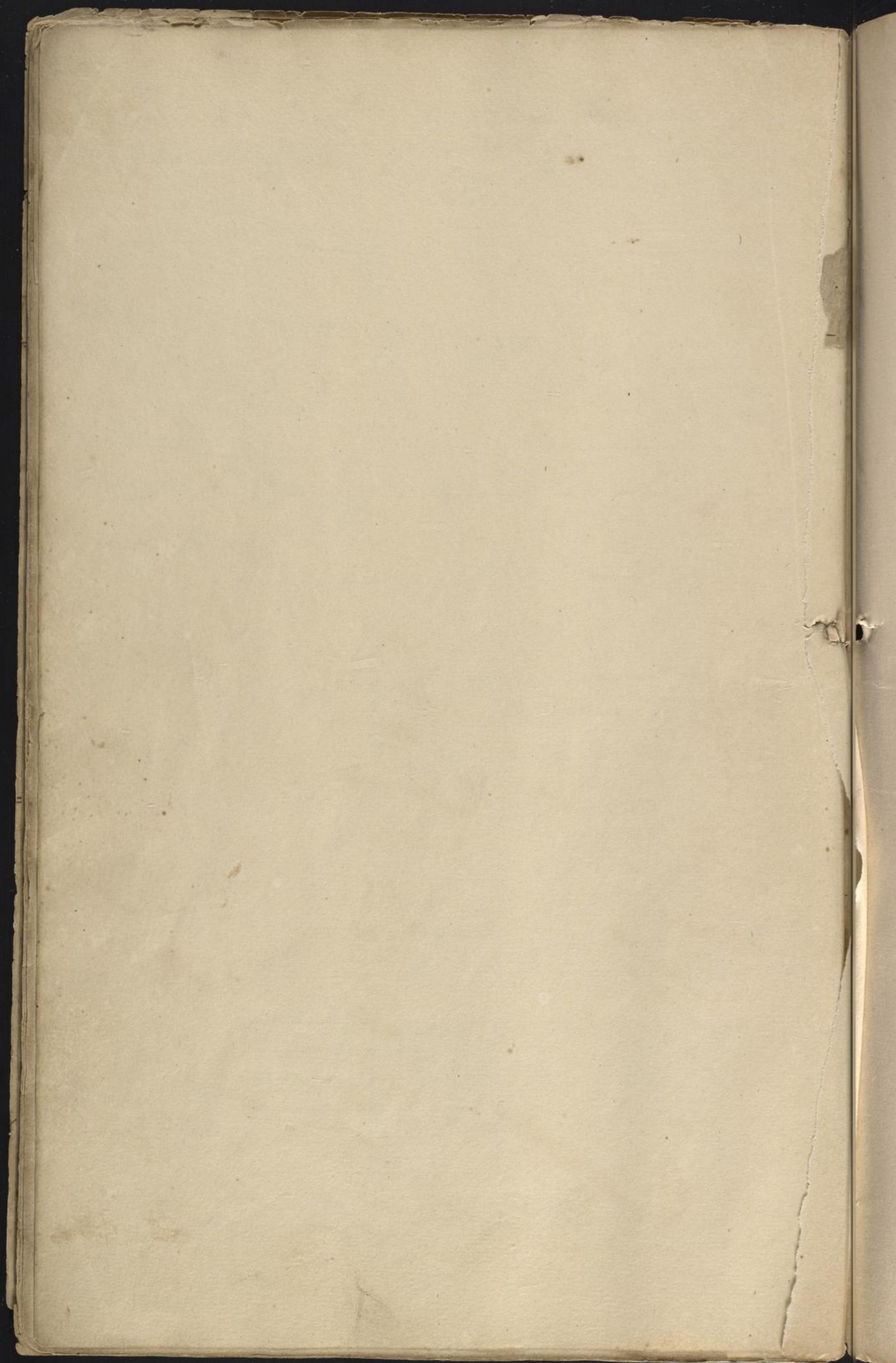
2925424

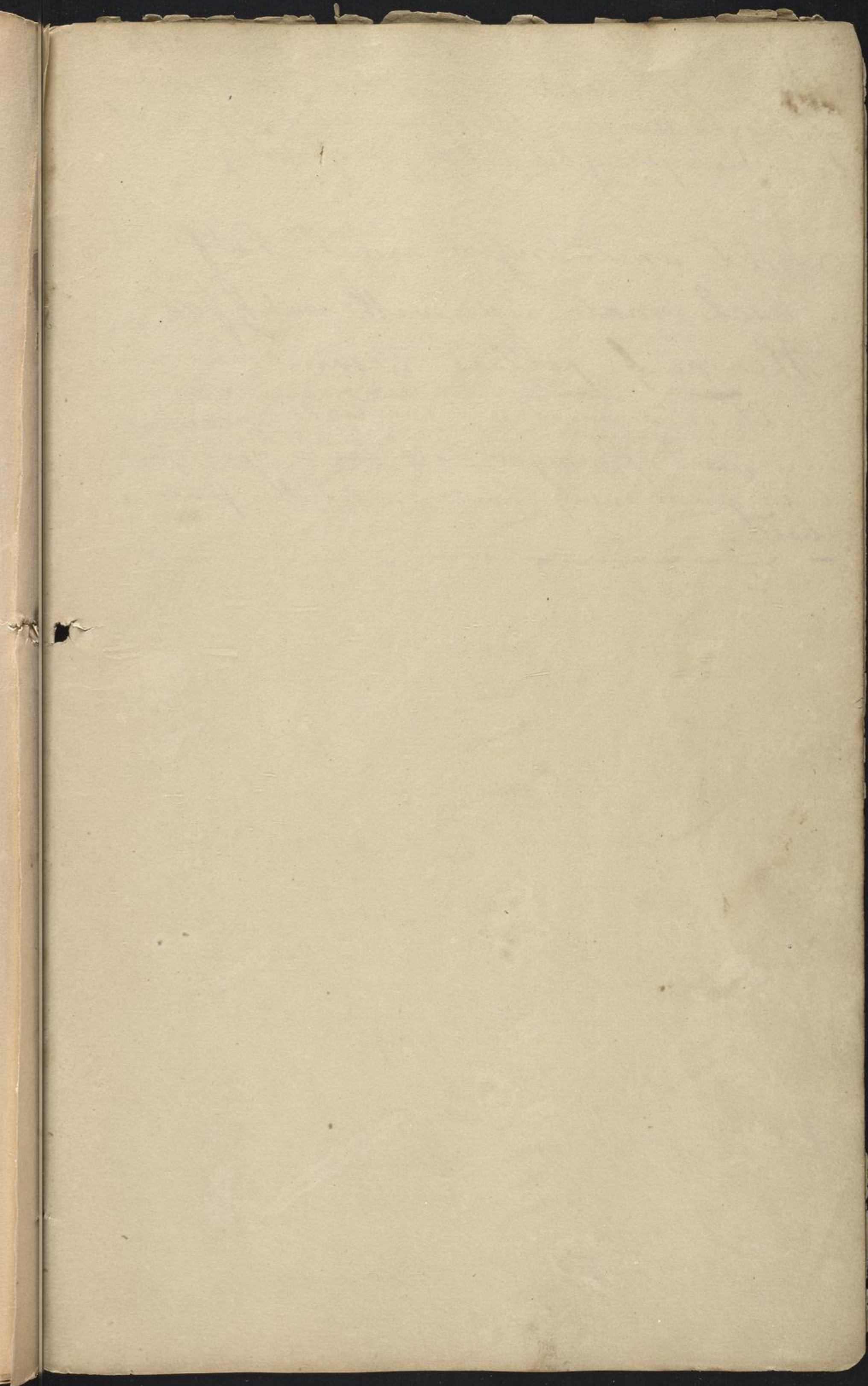
Answer - 636 Inches of the 6

			3		
		2	7	6	
	1	9	5	1	9
		4	3	8	
			7		

1	2	7	6
9	5	1	
4	3	8	







How's Doctring for the Bats first Bleed in the
noth and then hole up there head about fif teen
minnets and then give them as much in digo as will
lie one aleven penny bit in three gills of whiskey

Salt and ingen meal half
each made up with milk for
the neck pollice warm

Salts of wormwood put one table spoonful
in a quant of ^{strong} vinegar half table spoonful
to be given every hour un til the fever a
bats

144
3.52

75	182
28	164
50	050
1 25	3.96
2 78	2 78
	1 18

weaving 144 yards and spinning 12 dozen — 200

paper

292

382

5.52

5.17

one order to the store

100

35 dms

seventy five cents worth of paper, 25 Rachel fields

25

twenty five cents worth of butter

5.17

fish twenty five cents worth

Samuel

Cumby

James M. Hornick

JOHN OF

Henry Springer

William

Joe B

Etherman

Jan 10 1865 and 1/2 of the balance of the season.
This amount I have deposited with the first of
Feb. 1865 now being his last account.

[Faint, illegible handwriting visible through the paper.]

Stephen H. H.

[Faint handwritten numbers and scribbles]

1830

$$\begin{array}{r}
 200 \\
 100 \\
 \hline
 300
 \end{array}$$

$$\begin{array}{r}
 250 \\
 100 \\
 \hline
 350 \\
 100 \\
 \hline
 450 \\
 100 \\
 \hline
 550 \\
 100 \\
 \hline
 650 \\
 100 \\
 \hline
 750 \\
 100 \\
 \hline
 850 \\
 100 \\
 \hline
 950 \\
 100 \\
 \hline
 1050
 \end{array}$$

1150

2200

1845

(Faint handwritten notes or bleed-through from the reverse side)

18

[Faint handwritten numbers and scribbles]

1552.00	1450.00	1400.00	1350.00
1552.00	1450.00	1400.00	1350.00

[Faint handwritten text, likely bleed-through from the reverse side.]

A Gentleman divided his Estate among
 his several sons Equally by the first he
 gave 100 and $\frac{1}{8}$ of the balance the second
 he gave 200 and $\frac{1}{8}$ of the balance the third
 he gave 300 and $\frac{1}{8}$ of the balance And so on
 till he had his Estate divided how many sons
 had he and what was each mans share and
 what was his estate Ans 7 sons each 700 = 4900

$$\begin{array}{r} 1700 \\ 100 \\ \hline 8 \overline{) 1600} \\ 200 \\ 100 \\ \hline 300 \text{ first sons share} \end{array}$$

Suppose 1st 1700

$$\begin{array}{r} 1700 \\ 300 \\ \hline 1400 \\ 200 \\ \hline 1200 \\ 150 \\ 200 \\ \hline 350 \text{ second sons} \\ 300 \\ \hline 50 = 1^{st} \text{ Error} \end{array}$$

2nd 3300
 Suppose 3300

$$\begin{array}{r} 3300 \\ 100 \\ \hline 8 \overline{) 3200} \\ 400 \\ 100 \\ \hline 500 \text{ first sons share} \end{array}$$

$$\begin{array}{r} 3300 \\ 500 \\ \hline 2800 \\ 200 \\ \hline 2600 \\ 325 \\ 200 \\ \hline 525 \text{ second sons share} \\ 500 \\ \hline 25 = 2^{nd} \text{ Error} \end{array}$$

$$\begin{array}{r} 1700 \quad 50 = 165000 \\ 3300 \quad 25 = 42500 \\ \hline 1700 \overline{) 122500} \\ 17500 \\ 25 \\ \hline 42500 \end{array}$$

$$\begin{array}{r} \text{Estate} \\ 4900 \\ 100 \\ \hline 5000 \\ 225 \\ 225 \\ \hline 4800 \\ 600 \\ 100 \\ \hline 700 \end{array}$$

Each 700 / 4900 (7 sons each 700 whole Estate 4900)
 Answer

Samuel Marmist

James Thompson

Handwritten signature: *Handwritten signature*

en demande with interest till paid without defalcation value received

Philadelph. 9th Mo 1781

demand with interest till paid without deduction of value received

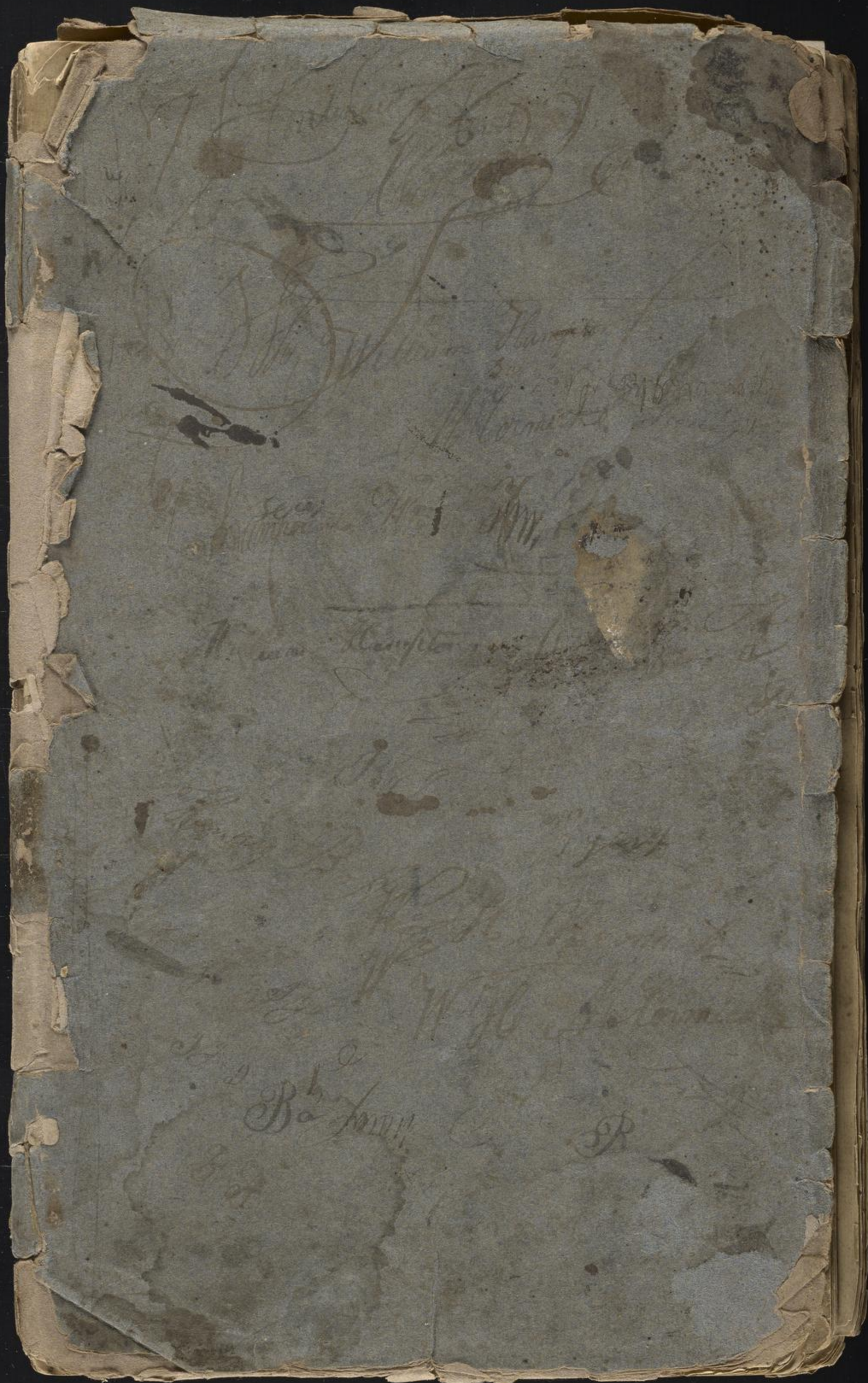
Philadelphia July 9th 1818

Stays on demand with interest till paid, without deduction

Michaelmas July 9th 1721

Examples of penmanship
By constant exercise
The penmanship of penmanship
The penmanship of penmanship is
The penmanship of penmanship is
The penmanship of penmanship is
The penmanship of penmanship is

Penmanship
S S S S S S S S
S S S S S S S S
N N N N N N N N
N N N N N N N N
N N N N N N N N



13

6m

2

8

10

12

14

16

18

20

Shd. William ^{any} ~~the~~ ~~rule~~

Single Rule of Three

Examples

1. If 8 yards of cloth cost 32^s What will 24 yards cost

8 yds 32
24 yds 24

$\frac{32}{8} = 4$
 $4 \times 24 = 96$
Ans 96

23
24
25
27
1:72::49
72
198
693
7128

5. What will 4 cwt 8 lb of iron come to at 48 cts per lb

4 cwt 8 lb = 96 lb
96 lb at 48 cts = 4608 cts = 46^s 8

2. When sugar is sold at 12^s 32 cts per cwt what will 16 lb cost

1:12.32::16
12.32
287392

Ans 287392

112
19712
176 Ans

3. What is the amount of 3 cwt of coffee at 36 cents per lb

36
163
72
28

936
36
2816
1008

Ans 2816 and Mary

What will 23 24 25 and 27 yds at 42 cts per yard

6. What will 12 cwt of peack come to at 8 cts per lb

12 cwt = 288 lb
288 lb at 8 cts = 2304 cts = 23^s 4

7. If 4 dozen of stockings cost 68^s 40 cts what will 3 pairs cost

114:68.40::3
114)77820 (180 grace

8. If 20 bushels of oats cost 9^s 60 cts what will 3 bushels come to

20:960::3
20)2880

144

Single Rule of Three

A merchant bought a piece of cloth for 168 50 cts at 75 cts per yd how many yards were there in the piece

$$\begin{array}{r} 175 : 1 :: 168.50 \\ 75 \overline{) 16850} \quad 22 \\ \underline{150} \\ 150 \end{array}$$

10 If 17 cwt 3 qr 17 lb of sugar cost 320 80 cts what must be paid for 607 ^{cwt} _{qr} _{lb} $17-3-17 = 17:32080::6$

$$\begin{array}{r} 71 \quad 32080 \quad 192480 \quad 6 \\ 28 \quad \underline{192480} \\ 585 \\ 142 \\ \underline{2005} \\ 16 \\ \underline{12030} \\ 12005 \\ \underline{132080} \end{array}$$

11 If 9.7 lb of silver is worth 978 what is the value of 1.507

$$\begin{array}{r} 97 : 97 :: 15 \\ 12 \quad 97 \\ \underline{1164} \quad 105 \\ 133 \quad \underline{1164} \quad 12 \\ 1164 \quad 1455 \\ \underline{1164} \\ 2810 \\ 2328 \\ \underline{5820} \\ 5820 \end{array}$$

12 If 125.5 acres are sold for 6278 what will 4.75 acres cost

$$\begin{array}{r} 125.5 : 6275 :: 4.75 \\ 475 \\ \underline{31075} \\ 43915 \\ \underline{25100} \\ 1255 \overline{) 2980525} \quad 2375 \\ \underline{2510} \\ 4705 \\ \underline{3765} \\ 9402 \\ \underline{8775} \\ 6275 \\ \underline{6275} \end{array}$$

13 If 15 gallons of wine cost 4.50 cts what will 15 tons cost Gal \$ To

$$\begin{array}{r} 15 : 4.50 :: 15 \\ 4 \\ \underline{60} \\ 60 \\ 378 \\ \underline{450} \\ 18900 \\ 1512 \\ 1.5 \overline{) 70100} \quad 1134 \text{ Ans} \\ 15 \\ \underline{20} \\ 15 \\ \underline{51} \\ 45 \\ \underline{60} \\ 60 \end{array}$$

14 How many reams of paper at 18 66 cts 1890 cts and 28 31 cts per ream many reams be purch for 5208 66 cts of each an equal number

$$\begin{array}{r} 1866 \\ 197 \\ \underline{231} \\ 594 : 1 :: 52866 \\ 594 \overline{) 52866} \quad 89 \\ \underline{4752} \\ 5346 \\ \underline{5346} \end{array}$$

Single Rule of Three

When iron is sold for 22 1/2 \$ per ton what will 19 1/2 lb cost

$$\begin{array}{r} 1 : 224 : : 1 = 14 \\ 20 - 42 \quad 25 \\ \hline 20 \quad 448 \quad 42 \\ 4 \quad 896 \\ 8 \quad 6240 \quad 9408 \quad 420 \\ 282 \quad 8960 \\ \hline 2240 \quad 4480 \\ 4480 \end{array}$$

$$\begin{array}{r} 1 : 225 : 365 \\ 225 \\ \hline 1825 \\ 730 \end{array}$$

19

$$\begin{array}{r} 1821.25 \\ 378.75 \\ \hline 1200.00 \end{array}$$

What will 4 to 10 cut 1 gr 12 lb of hay come to at 1.12 cts per cut

$$\begin{array}{r} 1 : 112 : : 4 = 1.0 = 1 = 12 \\ 4 \\ \hline 4 \\ 28 \\ \hline 112 \end{array}$$

$$\begin{array}{r} 290.0 \\ 722 \\ \hline 10120 \\ 112 \end{array}$$

A merchant paid 402 8 50 cts for flour at 5 50 cts per bbl how many bbls must he receive

$$\begin{array}{r} 550 : 1 : : 140250 \\ 550 \overline{) 140250} \quad 255 \\ 110 \\ \hline 302 \\ 275 \\ \hline 275 \\ 275 \end{array}$$

$$\begin{array}{r} 112 \quad 20240 \\ 10120 \\ \hline 10120 \end{array}$$

20

How much will a grind stone 4 ft 6 inches diam and 9 inches thick come to at 1.90 cts per cubic foot

$$\begin{array}{r} 1728 \quad 110 : 1.9683 \\ 196830 \\ \hline 19683 \\ 1728 \overline{) 2165130} \quad 1253 \\ 1728 \\ \hline 4371 \\ 3456 \\ \hline 9153 \\ 8640 \\ \hline 5130 \end{array}$$

A man has a yearly salary of 1186 8 25 cts how much is it per day

$$\begin{array}{r} 365 : 118625 : : 1 \\ 365 \overline{) 118625} \quad 325 \\ 1095 \\ \hline 912 \\ 730 \\ \hline 1825 \\ 1825 \end{array}$$

A man spends 2.55 cts per day and saves 3488 4 cts at the end of the year what is his yearly salary

$$\begin{array}{r} 1728 \quad 110 : 1.9683 \\ 196830 \\ \hline 19683 \\ 1728 \overline{) 2165130} \quad 1253 \\ 1728 \\ \hline 4371 \\ 3456 \\ \hline 9153 \\ 8640 \\ \hline 5130 \end{array}$$

22

29

250 8 50 cts paid
for 48 pieces of cloth
dollar at the rate of 1125 cts
for 5 yds how many yds
were in each piece allowing an
equal number to each piece

$$\begin{array}{r} 1728 : 190 = 20580 \\ \underline{190} \\ 1852200 \\ \underline{205800} \end{array}$$

24th I 12 $\frac{1}{2}$ gds of muslin cost
1 lb 14s 6d what is it per

125 N = 17 = 8

$$\begin{array}{r} 20 \\ 37 \\ 12 \\ \hline 450 \\ 1 \end{array}$$

125 | 450 (2) 36
375
750
750

25

wil 203 to 9 cwt 3 qr 3 lb of If a staff 4 ft long
 tobacco come to east a shadow on level
 To ll. s. To cwt or lb ground 17 feet long what

$$\begin{array}{r} 20 \cdot 228 \cdot 203 \cdot 9 = 3 = 3 \\ \hline 20 \quad 20 \quad 20 \\ \hline 20 \quad 448 \quad 20 \\ \hline 4 \quad 4069 \\ \hline 8 \quad 28 \\ \hline 28 \quad \sqrt{30235} \\ \hline 110 \quad 3285 \end{array}$$
 what is the height of a sta-
 ple whose shade at the sun
 time is 218 feet 4 inches

Q. If a staff 4 ft long
cast a shadow on level
ground 17 feet long what
what is the height of a ste-
ple whose shade at the same
time is 218 feet 9 inches

$17:4::218=9$
 12
 $84 \overline{) 2628} \quad 125$
 $84 \overline{) 10500} \quad (125$
 84
 210
 168
 420
 420

Single Rule Of Three Direct

26 If 4292832 1/2 etc are paid Bought 3 pipes of wine
for 476 A 3 R 28 P of land containing 120 + 124
how much is it per acre and 126 3/4 gallons at
5 D 6 D per gallon what
Do they cost

$$\begin{array}{r} \text{A} \quad \text{R} \quad \text{P} \quad \text{D} \quad \text{C} \quad \text{S} \\ 476 = 3 = 28 : 42928325 : 1 \\ \hline 1907 \quad 257539500 \\ 40 \quad 4292325 \\ \hline 473080 \quad 68672000 \quad 900 \\ \hline 686720 \quad 100 \end{array}$$

$$\begin{array}{r} 120 \frac{1}{2} \\ 124 \\ \hline 126 \frac{3}{4} \\ 1 : 5 = 6 : 37125 \\ \hline 66 \\ 222750 \\ 222750 \\ \hline 2450250 \\ 200 \end{array}$$

27 If a mans anual income be
13338 and he and he spends
dayly 214 etc how much will
he save at the end of the year

$$\begin{array}{r} 12 \overline{) 240502} \\ 20 \overline{) 041} = 10 \\ 102 = 1 = 10 \text{ Ans} \end{array}$$

$$\begin{array}{r} 1 : 214 : 365 \\ \hline 133308 \\ 78110 \\ \hline 55190 \text{ Ans } 780 \\ 78110 \end{array}$$

31 A sets out for a
certain place and
goes 12 mile aday 5 day
after he sets out from
the same place

28 If 321 bushels of wheat cost 2408 the same way and
etc what is it per bushel goes 16 miles a da
in how many days will
he overtake

$$\begin{array}{r} 321 : 24075 : 1 \\ 321 \overline{) 24075} \quad 75 \text{ Ans} \\ \hline 2247 \\ \hline 1605 \\ \hline 1605 \end{array}$$

$$\begin{array}{r} 16 \\ 4 : 5 : 12 \\ \hline 460 \\ 75 \text{ Ans} \end{array}$$

29 If 1 1/2 qrs of cloth cost 250 etc 32
what will 1 qr 2 no come to

$$\begin{array}{r} 15 : 250 : 1 = 2 \\ \hline 4 \quad 644 \\ 6 \quad 15066 \\ 24 \quad 1444 \\ \hline 152 : 250 : 15 \\ \hline 4 \quad 60 \\ 6 \quad 15000 \quad 62460 \\ \hline 1444 \quad \text{Ans} \\ \hline 60 \\ 48 \\ \hline 12 \overline{) 12} = 1 \\ 12 \overline{) 24} = 2 \end{array}$$

If i have owing
to me 100 lb and
compound with my
Debtor at 12 CD per lb
how much must I re

$$\begin{array}{r} 365 : 75 : 500 \\ \hline 2500 \text{ Ans} \\ 3500 \\ 36 \overline{) 37500} \quad 10254 \\ \hline 365 \\ 1000 \\ 730 \\ \hline 17 \overline{) 27054} \\ 365 = 74 \end{array}$$

Single Rule Of Three

33 If 365 days men consume 75 lbs of pork in 19 months how many will 500 men consume in the same time

$$365 : 75 :: 500 : x$$

$$\begin{array}{r} 2500 \\ 365 \overline{) 9500} \\ \underline{365} \\ 1000 \\ \underline{720} \\ 280 \\ 365 \overline{) 2800} \\ \underline{720} \\ 1000 \\ \underline{720} \\ 280 \end{array}$$

34

How much land at 250 cts per acre must be given in change for 360 acres at 375 cts

$$250 : 360 :: 375 : x$$

$$\begin{array}{r} 22500 \\ 250 \overline{) 36000} \\ \underline{1250} \\ 22500 \end{array}$$

35

If the earth which is 360 deg in circumference turns around on its axis in 24 hours how far are the inhabitants at the equator carried in one minute a deg there being 69.5 miles

$$24 : 360 :: 1 : x$$

$$1740 : 69.5 :: 1 : x$$

$$\begin{array}{r} 3240 \\ 1740 \overline{) 36000} \\ \underline{1740} \\ 1860 \\ \underline{1740} \\ 1200 \\ \underline{1140} \\ 600 \\ \underline{540} \\ 600 \\ \underline{540} \\ 600 \end{array}$$

1 If 20 men can build a wall in 12 days how long will it require 40 men to build the same

$$20 : 12 :: 40 : x$$

2 If 60 men can build a bridge in 100 days how long will it require 20 men to build it

$$60 : 100 :: 20 : x$$

3 If a wall 100 yards long requires 65 men 14 days in what time would 5 men complete it

$$65 : 14 :: 5 : x$$

4 If a barrel of flour will last a family of 6 per sons 24 days how long will it last if 3 more were added to the family

$$6 : 24 :: 9 : x$$

5 If 5 Dollars is paid for the carriage of 100 cwt weight 150 m how far may 6 cwt be carried for the same money

$$1 : 150 :: 6 : x$$

Single Rule of Three

6 If a street 80 feet long wide and 100 yds long can be paved in 45 by 40 men in 80 20 Days what length will one of 60 feet wide be paved by the same men in the same time

$$\begin{array}{r} 80:300::60 \\ 60 \overline{) 2400} \quad \text{Ans} \\ \underline{24} \end{array}$$

7 If a field that is 30 rods long 80 wide and 80 in length contain gain it in 15 years 15 acres how wide must one be to contain the same quantity that is but 130 rods long

$$\begin{array}{r} 80:30::70 \\ 170 \overline{) 2100} \quad \text{1 Rod} \\ \underline{21} \end{array}$$

8 If a board be 15 garters wide what length must it be to measure 12 square feet

$$\begin{array}{r} 1:12::75 \\ 75 \overline{) 1200} \quad \text{16} \\ \underline{75} \\ 450 \\ \underline{450} \end{array}$$

9 How much cloth 125 yds wide can be lined by 425 yds of silk that is 75 of a yd wide

$$\begin{array}{r} 75:425::125 \\ 125 \overline{) 31875} \quad \text{235} \\ \underline{125} \\ 2125 \\ \underline{2125} \\ 2975 \\ \underline{2975} \\ 250 \\ \underline{250} \\ 887 \\ \underline{887} \\ 625 \\ \underline{625} \end{array}$$

10 If 10 men could complete a building in 45 Mo what time would it require if 5 more were added

$$\begin{array}{r} 10:45::15 \\ 15 \overline{) 450} \\ \underline{30} \end{array}$$

11 In what time will 600 Dollars gain 50% when

$$\begin{array}{r} 10:45::15 \\ 15 \overline{) 450} \\ \underline{30} \end{array}$$

12 If a traveller can perform a journey in 4 Days when the days are 12 hours long what time will he require when the days are 16 hours long

$$\begin{array}{r} 12:48::16 \\ 16 \overline{) 480} \end{array}$$

13 Suppose 400 men in a gar are supplied with provisions for 30 Days how many men must be sent out if they would have the provisions last 50 Days

$$\begin{array}{r} 400:30::50 \\ 14 \overline{) 160} \quad 50 \overline{) 12000} \\ \underline{14} \end{array}$$

Lent a friend 292\$ for 6 months afterwards I borrow from him 806\$ how long must I keep it to be in the favour

$$\begin{array}{r} 292:6::806 \\ 806 \overline{) 1752} \end{array}$$

Single Rule Of Three

15

1200 men stationed in a garrison have provision for 9 months at the rate of 14 ounces per day how long at the same ~~time~~ allowance will the same provisions last if they are reinforced by 1100 men and also what diminution must be made on each ration that the provision may last for the same time

$$1200 : 9 : 1600$$

$$1600 \overline{) 10800} \text{ (64)}$$

$$4 \overline{) 12} = 3$$

$$4 \overline{) 16} = 4$$

$$400 : 14 : 1600$$

$$1600 \overline{) 5600} \text{ (35)}$$

$$8 \overline{) 16} = 2$$

16

If a piece of land 40 rods in length and 4 in breadth make an acre how wide must it be if it is but 25 rods long

$$40 : 4 : 25$$

$$25 \overline{) 160} \text{ (64)}$$

$$5 \overline{) 10} = 2$$

$$5 \overline{) 25} = 5$$

17

How much in length that is 3 inches broad will make a square foot

$$12 : 12 : 3$$

$$3 \overline{) 144} \text{ (48) Ans}$$

18 If a pasture field will feed 6 cows 91 days how long will it feed 21 cows

$$6 : 91 : 21$$

$$21 \overline{) 546} \text{ (26)}$$

$$126$$

19

There is a cistern having 1 pipe which will empty it in 10 hours how many pipes of the same capacity will empty it in 24 minutes

$$10 : 1 : 24$$

$$60$$

$$24 \overline{) 600} \text{ (25)}$$

$$120$$

$$120$$

20

How many yds of carpet that is half a yard wide will cover a floor that is 30 foot long and 18 foot wide

$$30 : 18 : 15$$

$$15 \overline{) 5400} \text{ (360) Ans}$$

$$90$$

$$90$$

$$0$$

Single Rule Of Three

21 What is the weight of the pea of a steel yard 10 lb in how many days will which being suspended 39 inches from the center of motion will equilibrate 28 lb suspended at the draught end 34 of an inch

$$\begin{array}{r} 75 : 208 :: 39 \\ \hline 75 \\ 1040 \\ 1456 \\ 39 \overline{) 15600} (4 \\ \underline{156} \end{array}$$

22 A and B Depart from the same place and traveled the same road but A goes 5 Days before B at the rate of 20 miles a day B follows at the rate of 25 miles a day in what time and at what distance will he overtake A $\frac{25}{20} :: 5 : \frac{25}{5}$

$$\begin{array}{r} 20 : 25 :: 5 : \frac{25}{5} \\ \hline 5 \\ 5 \overline{) 100} \\ \underline{50} \\ 50 \end{array}$$

23 If 30 plough 12 Acres how many will 40 horses plough in the same time

$$\begin{array}{r} 30 : 40 :: 12 \\ \hline 12 \\ 30 \overline{) 480} (16 \\ \underline{30} \\ 180 \\ 180 \end{array}$$

24 If 30 horses plough 12 Acres in how many days will 40 horses plough the same quantity

$$\begin{array}{r} 40 : 30 :: 10 \\ \hline 10 \\ 40 \overline{) 300} (7.5 \\ \underline{280} \\ 20 \end{array}$$

3 If 800 soldiers in a garrison have provision sufficient for 2 months how many must depart that that the provision may last them for 5 months

$$\begin{array}{r} 2 : 800 :: 5 \\ \hline 2 \\ 5 \overline{) 1600} (320 \\ \underline{320} \\ 1280 \end{array}$$

4 Bought a Tho of madder wine for 1798 nine gallons of which leaked out what was the remainder per gallon to gain 128 on the whole

$$\begin{array}{r} 1 \\ \hline 66 \\ 63 \\ 9 \\ 54 \overline{) 117428} (216 \\ \underline{108} \\ 348 \\ \underline{216} \\ 232 \\ \underline{216} \\ 160 \\ \underline{108} \end{array}$$

The Rule By William H. M.

5 If 225 lb. be carried 512 m for 20 Dollars how many lb. may be carried 64 m for the same money

$$\begin{array}{r}
 64:542:225 \\
 \underline{225} \\
 2580 \\
 1024 \\
 1024 \\
 64 \overline{) 115200} \quad (1800 \\
 \underline{64} \\
 512 \\
 \underline{512} \\
 00
 \end{array}$$

6 If 6 men in 8 Days earn 140 \$ how much will 12 men earn in 24 Days

$$\begin{array}{r}
 6 \quad \{ \quad 12 \\
 8 \quad \{ \quad 24 \\
 \underline{48} \quad \{ \quad 288 \\
 \quad \quad \quad 100 \\
 48 \overline{) 28800} \quad (600 \\
 \underline{288} \\
 00
 \end{array}$$

3 If a 87850 cts be assured on 1750 \$ what is the rate of 10 \$ at the same rate

$$\begin{array}{r}
 1750:110:18750 \\
 \quad \quad \quad 10 \\
 175 \overline{) 87500} \quad (50 \\
 \underline{8750} \\
 0
 \end{array}$$

4 If 8 students spend 384 \$ in 6 months how much will maintain 12

$$\begin{array}{r}
 8 \quad \{ \quad 384 \quad 12 \\
 6 \quad \{ \quad 120 \quad 10 \\
 \underline{48} \overline{) 46080} \quad (960 \quad 20 \\
 \underline{432} \\
 288 \\
 \underline{288} \\
 0
 \end{array}$$

1 If 10 bushels will serve 18 horses for 20 Days how many bushels will serve 60 horses 36 Days

$$\begin{array}{r}
 18 \quad \{ \quad 60 \\
 20 \quad \{ \quad 36 \\
 \underline{360} \quad \{ \quad 360 \\
 \quad \quad \quad 180 \\
 360 \overline{) 21600} \quad (60 \\
 \underline{216} \\
 00
 \end{array}$$

2 If 56 lb of bread will 7 men 14 D how much bread will serve 21 men 3 Days

$$\begin{array}{r}
 7 \quad \{ \quad 21 \\
 14 \quad \{ \quad 63 \\
 \underline{56} \quad \{ \quad 56 \\
 \quad \quad \quad 378 \\
 315 \\
 98 \overline{) 3528} \quad (36 \\
 \underline{294} \\
 588 \\
 \underline{588} \\
 0
 \end{array}$$

5 If 2000 weight is carried 30 miles for 25 miles \$ how much must be given for the carriage of 1000 weight 100 miles

$$\begin{array}{r}
 50 \quad \{ \quad 100 \\
 20 \quad \{ \quad 4000 \\
 \underline{1000} \quad \{ \quad 25 \\
 \quad \quad \quad 20000 \\
 \quad \quad \quad 80000 \\
 1000 \overline{) 100000} \quad (100 \text{ Ans} \\
 \underline{10000} \\
 0
 \end{array}$$

Double Rule Of

6 If 14 \$ interest is gain^{ed} by 100 \$ in 6 months how what will be the interest of 400 \$ for 5 years

$$\begin{array}{r} 700 \\ 14200 \end{array} \left\{ \begin{array}{l} 14 \\ 400 \end{array} \right. \begin{array}{r} 60 \\ 24000 \\ 24 \\ 96006 \\ 24000 \\ 4200 \end{array} \left\{ \begin{array}{l} 336000 \\ 336 \end{array} \right. \begin{array}{r} 0 \\ 80 \end{array}$$

6 If 7 men can reap 84 acres of grain in 12 Days how many men can reap 100 \$ in 5 D

$$\begin{array}{r} 84 \\ 1680 \end{array} \begin{array}{r} 12 \\ 100 \end{array} \begin{array}{r} 7 \\ 400 \\ 12 \end{array} \begin{array}{r} 1680 \end{array} \left\{ \begin{array}{l} 8400 \\ 840 \end{array} \right. \begin{array}{r} 5 \end{array}$$

7 If 14 men can do 12 rods of ditching in 6 Da how many rods of ditching may be done by 8 men in 24 Days

$$\begin{array}{r} 24 \\ 24 \end{array} \left\{ \begin{array}{l} 12 \\ 8 \end{array} \right. \begin{array}{r} 24 \\ 8 \end{array} \begin{array}{r} 192 \\ 12 \end{array} \begin{array}{r} 24 \end{array} \left\{ \begin{array}{l} 220496 \\ 212 \end{array} \right. \begin{array}{r} 84 \\ 84 \end{array}$$

6 If 40 cts are paid for the carriage of 200 lbs for 10 miles how far may 20 200 lb be carried for 60 \$ 60 cts

$$\begin{array}{r} 20200 \\ 40 \end{array} \begin{array}{r} 40 \\ 200 \end{array} \begin{array}{r} 200 \\ 6060 \end{array} \begin{array}{r} 808000 \end{array} \left\{ \begin{array}{l} 1212000 \\ 40 \end{array} \right. \begin{array}{r} 808000 \end{array} \left\{ \begin{array}{l} 4848000 \\ 4848 \end{array} \right. \begin{array}{r} 60 \end{array}$$

7 If 5 men spend 200 \$ in 22 weeks and 6 days how long will 300 \$ support 12 men

$$\begin{array}{r} 200 \\ 12 \end{array} \begin{array}{r} 226 \\ 7 \end{array} \begin{array}{r} 300 \\ 5 \end{array} \begin{array}{r} 21100160 \end{array} \begin{array}{r} 1500 \\ 160 \end{array} \begin{array}{r} 71100 \end{array} \begin{array}{r} 2400 \end{array} \left\{ \begin{array}{l} 24000 \\ 24 \end{array} \right. \begin{array}{r} 100 \end{array} \begin{array}{r} 14=2 \end{array} \begin{array}{r} 60 \end{array} \begin{array}{r} 100 \end{array}$$

8 If 4 men are paid 24 \$ for 3 Days work how many men can reap 100 Acres

$$\begin{array}{r} 24 \\ 16 \end{array} \begin{array}{r} 3 \\ 384 \end{array} \begin{array}{r} 1536 \\ 384 \end{array} \begin{array}{r} 384 \end{array} \left\{ \begin{array}{l} 4808 \\ 384 \end{array} \right. \begin{array}{r} 12 \end{array} \begin{array}{r} 768 \\ 768 \end{array}$$

1 If 12 oxen in 8 eat 10 Acres of clover how many acres will serve 24 oxen 48 Days

$$\begin{array}{r} 12 \\ 8 \end{array} \left\{ \begin{array}{l} 10 \\ 24 \end{array} \right. \begin{array}{r} 24 \\ 148 \end{array} \begin{array}{r} 1152 \end{array} \begin{array}{r} 98 \end{array} \left\{ \begin{array}{l} 11520 \\ 96 \end{array} \right. \begin{array}{r} 120 \end{array} \begin{array}{r} 192 \\ 192 \end{array} \begin{array}{r} 6 \end{array}$$

Practice Continued By Wm H. McCormick

2 A person engaged to remove 8000 lb 15 miles in 7 days with 18 horses in 6 days he removed 14500 cwt how many horses will be necessary to remove the rest in the remaining 3 days

$$\begin{array}{r}
 14500 \\
 18 \quad 8000 \\
 \hline
 13500 \quad 14500 \\
 \quad 3500 \\
 \quad 6 \\
 \hline
 21000 \\
 18 \\
 \hline
 168000 \\
 21000 \\
 \hline
 13500 \quad 37800 \quad 0.28 \\
 270 \\
 \hline
 1080 \\
 1080
 \end{array}$$

By cancelling

$$\begin{array}{r}
 225 \\
 173 \\
 1025 \\
 82 \\
 9 \\
 \hline
 738
 \end{array}
 \quad
 \begin{array}{r}
 123 \\
 2 \\
 \hline
 246 \\
 2 \\
 \hline
 492 \\
 25 \\
 \hline
 2460 \\
 984 \\
 \hline
 1025 \quad 12300 \quad (12 \text{ Ans}) \\
 1025 \\
 \hline
 2050 \\
 2050
 \end{array}$$

3 If the carriage of 9 hogs heads of sugar each weighing 12 cwt for 60 miles cost 100\$ what must be paid for the carriage of 50 bbls of sugar each weighing 25 cwt 300 miles

$$\begin{array}{r}
 9 \quad 100 \quad 50 \\
 12 \quad 25 \\
 \hline
 108 \quad 1250 \\
 60 \quad 300 \\
 \hline
 6480 \quad 375000 \\
 6480 \quad 375000 \quad 100 \\
 \hline
 6480 \quad 375000 \quad 100 \quad 578.70 = \\
 3240 \\
 \hline
 5100 \\
 4536 \\
 \hline
 5640 \\
 5184 \\
 \hline
 4560 \\
 4536 \\
 \hline
 24
 \end{array}$$

$$\begin{array}{r}
 225 \\
 173 \\
 1025 \\
 82 \\
 9 \\
 \hline
 738
 \end{array}
 \quad
 \begin{array}{r}
 123 \\
 2 \\
 \hline
 246 \\
 2 \\
 \hline
 492 \\
 25 \\
 \hline
 2460 \\
 984 \\
 \hline
 1025 \quad 12300 \quad (12 \text{ Ans}) \\
 1025 \\
 \hline
 2050 \\
 2050
 \end{array}$$

4 If a celler which is dug 225 ft long 173 ft wide and 1025 ft deep is dug by 6 men in 25 days working 123 hours each day how many days of 82 hours will it require 9 men to dig one which is 45 feet long 346 wide and 123 deep

$$\begin{array}{r}
 225 \\
 173 \\
 1025 \\
 82 \\
 9 \\
 \hline
 738
 \end{array}
 \quad
 \begin{array}{r}
 123 \\
 2 \\
 \hline
 246 \\
 2 \\
 \hline
 492 \\
 25 \\
 \hline
 2460 \\
 984 \\
 \hline
 1025 \quad 12300 \quad (12 \text{ Ans}) \\
 1025 \\
 \hline
 2050 \\
 2050
 \end{array}$$

Practice Continued By W. H. C.

Case First
When the price consists of Dollars cts and mills Reduce the given quantity by multiplying as in whole numbers and point off from the right of ~~from the~~ mills and cts according to the rules of Federal money or multiply by 8 only and take aliquot parts for the cts and mills

2 $50 \frac{1}{2} 250$
 $25 \overline{) 250}$
 $\underline{125}$
 125
 13750

3 $20 \frac{1}{5} 200$
 $4 \overline{) 200}$
 $\underline{80}$
 120
 40
 84420

4 2200
 $10 \overline{) 2210}$
 $\underline{221}$
 2431.00

5 $40 \frac{1}{5} 421$ at 241.5
 $5 \overline{) 421}$
 $\underline{241}$
 180
 1016715 ans

6 $25 \frac{1}{4} 625$ at 25 cts
 $11 \overline{) 625}$
 $\underline{15625}$

7 $6 \frac{1}{4} 8275$ at 104.4
 $25 \overline{) 8275}$
 $\underline{331}$
 331
 536450

8 $5 \frac{1}{2} 8275$ at 5 mills
 $11 \overline{) 8275}$
 $\underline{41375}$

When the price is a fractional part of a \$ or cent such as $\frac{2}{3}$ thirds of a cent multiply the quantity by the numerator and divide the product by the denominator the quotient will be the ans

2 $4 \frac{2}{3} 2 = 14$ at $\frac{1}{4}$ of a dollar

14
 28
 490
 $4 \overline{) 490}$
 $\underline{12250}$

$12 - 2 = 10$
 4

50
 28
 1418
 2
 $3 \overline{) 2826}$

942
 $14 - 2 = 12$
 4
 58
 28
 471
 116
 $5 \overline{) 1691}$
 $\underline{3262}$
 4
 $8 \overline{) 22834}$
 $\underline{285425}$

1 Bought 6 hogshead of tobacco each weighing 125 cwt at $\frac{2}{3}$ of a dollar per lb what did it cost 125

6
 750
 4
 3000
 28
 24000
 600
 84000
 3
 $8 \overline{) 252000}$
 $\underline{3150}$

2 A gentle man bought a vessel of 80 ton burden and gave at the rate of $2 \frac{1}{2}$ eagles per ton what did the vessel cost

60
 $2 \frac{1}{2}$
 150
 36
 60
 1560
 $5 \overline{) 80}$
 $\underline{36}$

Practice Continued

3 Carpenter bought 12650 feet of boards at 1078 $\frac{3}{4}$ per thousand what did they cost him

$$\begin{array}{r} 125 \\ 75 \\ \hline 3000 \\ 28 \\ \hline 84000 \\ 8 \overline{)252000} \\ 3150 \end{array}$$

Case 2nd

When the price and quantity given are of several denominations multiply the price by the integers or whole number and take aliquot parts for the rest

Bought 16 cut 1 gr 16 lb of tobacco at 128 42 cts per cut weight what did it cost

$$\begin{array}{r} 1 \quad 12844 \\ \quad 16 \\ \hline 7464 \\ 1244 \\ \hline 12211 \\ 12211 \overline{)19904} \\ 311 \\ \hline 17777 \\ 2039275 \end{array}$$

17 cut 3 gr 19 lb of sugar at 1089 4 cts per cut weight

$$\begin{array}{r} 1094 \\ 17 = 3 = 19 \\ \hline 7658 \\ 1094 \\ \hline 18598 \\ 14 \overline{)18598} \\ 5847 \\ \hline 22735 \\ 14 \overline{)22735} \\ 13645 \\ 39 \\ \hline 935 \\ 1760400 \end{array}$$

3 cut 1 gr 1 lb of tobacco at 138 41 cts per cut weight

$$\begin{array}{r} 1341 \\ 1 \\ \hline 6905 \\ 33525 \\ \hline 704025 \end{array}$$

4 15 cut 0 gr 19 lb of sugar at 15 8 5 mills per cut weight

$$\begin{array}{r} 15005 \\ 16 \overline{)15005} \\ 21835 \\ 2674 \\ \hline 1338 \\ 1095500 \end{array}$$

Case 4

When the price consists of lb shillings pence and farthings Reduce the given price to s and cts (see reduce of money page 41) and then proceed according to the foregoing case or multiply by the integers and take aliquot parts for the remainder

$$\begin{array}{r} 1 \quad 6 \overline{)4548} \text{ at 1 shilling} \\ \quad 2274 \\ \hline 2274 \\ 3412 = 909.60 \end{array}$$

$$\begin{array}{r} 2 \quad 341 \overline{)1} \quad 397 \text{ at } 3-4 \\ \quad 66-3=4 \\ \hline 20 \\ 1328 \\ \hline 12 \\ 91580 \\ \hline 1765 \\ 17645 \end{array}$$

Practice By William Hampton McCormick H. C. H.

1-8 15-9-5 at 1-8^d

$$\begin{array}{r} 1595 \\ 1355 \\ \hline 265 \\ 12 \\ \hline 9/3185 \\ 3538 \\ \hline 95388 \end{array}$$

10 158 at 12 shilling

$$\begin{array}{r} 158 \\ 25 \\ \hline 329 \\ 65=16 \\ \hline 394=16 \\ 20 \\ \hline 7896 \\ 12 \\ \hline 15992 \\ 7896 \\ \hline 89475 \text{ 2 ans} \end{array}$$

10 745 at 16^s

$$\begin{array}{r} 745 \\ 5 \\ \hline 372=10 \\ 186=5 \\ 37=5 \\ \hline 596=00 \\ 20 \\ \hline 11920 \\ 12 \\ \hline 9/143040 \\ 1589355 \\ \hline 1589335 \text{ Ans} \end{array}$$

10 969 at 19=11

$$\begin{array}{r} 969 \\ 8 \\ \hline 484=10 \\ 193=16 \\ 193=16 \\ 48=9 \\ 24=4=6 \\ 12=2=3 \\ 8=1=6 \\ \hline 964=19=3 \text{ ans} \end{array}$$

10 3715 at 9=14^t

$$\begin{array}{r} 3715 \\ 1 \\ \hline 743 \\ 743 \\ 185=15 \\ 46=8=9 \\ 23=4=42 \\ \hline 1441=81 \text{ 2 ans} \end{array}$$

10 4567

$$\begin{array}{r} 4567 \\ 5 \\ \hline 2283=16 \\ 1141=15 \\ 456=14 \\ 456=14 \\ 114=9 \\ 57=1 \\ 88=1 \\ 9=10 \\ \hline 45579=8 \frac{1}{2} \end{array}$$

Case 5th
When both the price of the integer and the quant are of different denomino multiply the price by the integers of the quantity an take parts of the price for those of the integers

1 What will 2 gr 14 lb of sugar come to at 3 lb 7^s 9^d per cut

$$\begin{array}{r} 37 \\ 2 \\ \hline 135 \\ 11=5 \\ 4=16 \\ 1=2=6 \\ 0=1=3 \\ 1=3=104 \\ 0=9=56 \\ \hline 154=11=1 \text{ ans} \end{array}$$

James
Mans
Gor

2 37 To 14 cut 2 gr 14 lb of at 89 lb 6^s 8^d per ton

$$\begin{array}{r} 37 \\ 68 \\ \hline 37=14=2=14 \\ 89=6=8 \\ \hline 333 \\ 42 \\ \hline 296 \\ 112=6=8 \\ 44=13=4 \\ 8=18=8 \\ 8=18=8 \\ 2=4=8 \\ 11=2 \\ \hline 3370=13=2 \text{ ans} \end{array}$$

frac
Ans
in term

3 ton 12 cut 3 gr 27 lb of sugar
at 89 lb 118 5 D. per cut 476 5

10	$\frac{1}{2}$	$\frac{12}{2} = 3 = 2 \frac{1}{2}$
1	$\frac{1}{2}$	$8 = 11 = 5$
4	$\frac{1}{8}$	$5 = 76$
1	$\frac{1}{4}$	36
2	$\frac{1}{2}$	$3 = 12$
1	$\frac{1}{2}$	$1 = 4$
14	$\frac{1}{2}$	6
7	$\frac{1}{2}$	$4 = 5 = 8 \frac{1}{2}$
14	$\frac{1}{2}$	$2 = 2 = 10 \frac{1}{4}$
8	$\frac{1}{2}$	$1 = 4 = 5$
2	$\frac{1}{2}$	$10 = 8 \frac{1}{2}$
		$6 = 1 \frac{1}{4}$
		$3 = 0 \frac{1}{2}$
		$625 = 11 = 10$

$7 = 4$
 20
 $144 = 2 = 21$
 $3 = 17 = 6$

 $5 \frac{1}{2} 432$
 72
 $26 \frac{1}{2} 38$
 18

 $922 \frac{1}{2}$
 $1 = 18 = 9$
 $9 = 8 \frac{1}{4}$
 $25 = 10$

 $7 \frac{1}{2} 560 = 13 = 3 \frac{1}{4}$

$4 \times 1 = 4$
 $1 \times 2 = 2$
 $6 \times 2 = 12$
 $3 \times 2 = 6$
 $2 \times 2 = 4$
 $20 \times 2 = 40$
 $1619 = 11 = 1 \frac{3}{4}$

$640 = 2 \times 2 \times 2 \times 2 \times 2 \times 5$

$$\begin{array}{r}
 1832 \\
 50 \overline{) 229} \\
 \underline{100} \\
 129 \\
 \underline{100} \\
 29 \\
 \underline{20} \\
 9
 \end{array}$$

Find the amount of the
tare and subtract it from the
gross weight the remainder will
be the meat weight

$$\begin{array}{r|l} 2 & 1 \\ 7 & 2 \\ 8 & 1 \\ 4 & 2 \end{array} \quad \begin{array}{l} 168 \\ 7 \\ 3=8 \\ 1=8 \end{array}$$

cut gr lb
 $12 - 3 = 12$
 $1 - 2 = 12$
 $16 = 100$ cons

$$\begin{array}{r|l} 2 & 1 \\ 7 & 2 \\ 8 & 1 \\ 4 & 2 \end{array} \quad \begin{array}{l} 168 \\ 7 \\ 3=8 \\ 1=8 \end{array}$$

cut gr lb
 $12 - 3 = 12$
 $1 - 2 = 12$
 $16 = 100$ cons

2 What will 3 bbls of sugar
come to at weighing as follows
No 1 2 cut 48 lb 25 lb no 2 2 cut 20 lb
no 3 2 cut 21 lb tare 21 lb per bbl
at 128 50 cts per cut

Tare and Tret by Wm. H. McCormick

cut gr lb
 $2 = 1 = 25$
 $2 = 2 = 00$
 $2 = 0 = 21$
 $7 = 0 = 18$

21
 $28 \overline{) 632}$
 $7 \overline{) 21}$
 $2 \overline{) 1250}$
 $6 \overline{) 7500}$
 625
 39285
 22321
 111605
 8244865

At 45 cts per lb what will 4
 bbls of indigo come to weighing
 as follows

cut gr lb tare lb
 $1 = 3 = 3$
 $2 = 1 = 10$
 $4 = 0 = 19$
 $4 = 0 = 00$
 $16 = 1 = 31$
 $1 = 0 = 20$
 $15 = 0 = 11$
 60
 28
 1681
 45
 8455
 6764
 876095 cts

Bought 9 hogshead of sugar
 each weighing 6 cwt 2 gr 12 lb gross
 tare 17 lb per cwt what is the neat
 weight and what does it amount
 to at 10.8 per cwt

$16 = 2 = 12$
 9
 $1 : 17 : 59 = 1 = 24$
 4
 28
 112
 1920
 474
 6660
 17
 $112 \overline{) 113220}$
 112
 122
 112
 100
 $28 \overline{) 1010}$
 36
 84
 170
 168
 2
 $9 = 2 = 14$
 $5 = 5 = 9 = 1 = 24$
 $90 = 2$
 $50 = 1 = 22$ cts
 cut gr lb

cut gr lb
 $1 : 16 : 58 = 1 = 22$
 4
 4
 28
 112
 4
 201
 28
 1610
 404
 5650
 16
 33900
 5650
 $112 \overline{) 90400}$
 896
 800
 784
 160
 112
 480
 448
 $32 \overline{) 32}$
 $112 = 3$

Sold 27 bags of coffee each 2 cwt 13 lb
 gross tare 13 lb per cwt
 tret 4 per 104 what is the neat
 weight and what will it come
 to at 32 cts per lb

cut gr lb
 $2 = 3 = 17$
 $78 = 1 = 11$
 3
 $77 \overline{) 1014}$
 77
 47
 $28 \overline{) 1018}$
 84
 178
 168
 10
 $9 = 0 = 10$
 $78 = 1 = 11$
 $9 = 0 = 10$
 $69 = 1 = 1$
 4
 277
 2828
 4
 $26 \overline{) 7557}$
 52
 255
 234
 217
 208
 19
 $2 = 2$ cut gr lb
 $66 = 2 = 11$
 4
 266
 28
 2928
 533
 7459
 32
 14918
 72377
 238588
 $68 = 2 = 11$
 $69 = 1 = 1$
 $2 = 2 = 18$
 $68 = 2 = 11$

Simple Interest Continued

1 What is the interest of 4548 for 1 year at 6 per cent

$$\begin{array}{r} 4548 \\ \times 6 \\ \hline 27288 \end{array}$$

2 Required the interest of the same sum for 5 years at the same rate

$$\begin{array}{r} 4548 \\ \times 6 \\ \hline 27288 \\ \times 5 \\ \hline 136200 \end{array}$$

3 Required the amount of the same sum for 5 years at the same rate

$$\begin{array}{r} 4548 \\ \times 6 \\ \hline 27288 \\ \times 5 \\ \hline 136200 \end{array}$$

4 What is the interest of 2008 for 2 years at 6 per cent

$$\begin{array}{r} 2008 \\ \times 6 \\ \hline 12048 \\ \times 2 \\ \hline 24096 \end{array}$$

5 What is the interest of 12808 for 1 year at 7 per cent

$$\begin{array}{r} 12808 \\ \times 7 \\ \hline 88256 \\ \times 1 \\ \hline 128080 \end{array}$$

6 What is the amount of a note for 5608 for a year at 8 per cent

$$\begin{array}{r} 5608 \\ \times 8 \\ \hline 44864 \\ \times 1 \\ \hline 56080 \end{array}$$

7 What is the sum must be given to discharge a bond given for 45208 on which there is 6 months interest at 6 per cent

$$\begin{array}{r} 4520 \\ \times 6 \\ \hline 27120 \\ \times 1 \\ \hline 45200 \end{array}$$

8 What is the amount of 408 for 2 years at 6 per cent

$$\begin{array}{r} 400 \\ \times 6 \\ \hline 2400 \\ \times 2 \\ \hline 4800 \\ \times 1 \\ \hline 4000 \end{array}$$

9 What is the interest of 49258 for 9 years at 7 1/2 per cent

$$\begin{array}{r} 4925 \\ \times 7 \\ \hline 34475 \\ \times 2 \\ \hline 68500 \\ \times 1 \\ \hline 49250 \end{array}$$

10 What is the amount of 2500 for 1 year at 7 1/4 per cent

$$\begin{array}{r} 2500 \\ \times 7 \\ \hline 17500 \\ \times 1 \\ \hline 25000 \end{array}$$

$$\begin{array}{r} 2500 \\ \times 1 \\ \hline 2500 \end{array}$$

Simple Interest By Wm H. Morrison H. C. M.

Case

W. H. C. A. S. E. B. W. H. M.

1 What is the interest of 2648 50 cts for 1 year at 6 per cent

$$\begin{array}{r} 2648.50 \\ \times .06 \\ \hline 158.9100 \end{array}$$

2 What is the interest 4689 22 cts and 5 mills for 1 year at 8 per cent

$$\begin{array}{r} 4689.225 \\ \times .08 \\ \hline 375.1380 \end{array}$$

3 What is the interest of 3648 50 cts for 5 year at 6 per cent per annum

$$\begin{array}{r} 3648.50 \\ \times .06 \\ \hline 218.9100 \\ \times 5 \\ \hline 1094.5500 \end{array}$$

4 What is the amount of a note for 12609 50 cts and 5 mills for 3 years at 12 per cent per annum

$$\begin{array}{r} 12609.505 \\ \times .12 \\ \hline 1513.1406 \\ \times 3 \\ \hline 4539.4218 \\ \hline 14122.6463 \end{array}$$

5 What sum will discharge a bond given for 130850 cts on which there is 5 years interest at 8 per cent per annum

$$\begin{array}{r} 1308.50 \\ \times .08 \\ \hline 104.6800 \\ \times 5 \\ \hline 523.4000 \\ \hline 1361.1800 \end{array}$$

1 What is the interest of 550 \$ for 3 months at 6 per cent per annum

$$\begin{array}{r} 550 \\ \times .05 \\ \hline 27.50 \end{array}$$

2 What is the interest of 860 \$ for 1 year and 6 months at 6 per cent per annum

$$\begin{array}{r} 860 \\ \times .09 \\ \hline 77.40 \end{array}$$

3 What is the interest of 420 \$ for 9 months at 8 per cent per annum

$$\begin{array}{r} 420 \\ \times .08 \\ \hline 33.60 \end{array}$$

4 What is the amount of a note for 720 \$ with 18 months interest due thereon at 4 per cent per annum

$$\begin{array}{r} 720 \\ \times .04 \\ \hline 28.80 \\ \times 1.5 \\ \hline 43.20 \\ \hline 748.80 \end{array}$$

5 What is the interest of 200 \$ for 15 months at 12 per cent per annum

$$\begin{array}{r} 200 \\ \times .12 \\ \hline 24.00 \\ \times 1.5 \\ \hline 36.00 \\ \hline 276.00 \end{array}$$

6 What is the interest of 1260 \$ for 4 months at 6 per cent

$$\begin{array}{r} 1260 \\ \times .06 \\ \hline 75.60 \\ \times .3333 \\ \hline 25.20 \\ \hline 100.80 \end{array}$$

Simple Interest

By Wm H. McCormick

5 What is the interest of 12000 for 40 days at 4 per cent per annum

$$\begin{array}{r} 7300 : 12000 : 20 \\ 7300 \overline{) 168000} \quad 23 \\ \underline{14600} \\ 22000 \\ \underline{21900} \\ 100 \end{array}$$

6 What is the interest of 8400 for 20 days at 5 per cent per annum

$$\begin{array}{r} 7300 : 8400 : 20 \\ 7300 \overline{) 168000} \\ \underline{14600} \\ 22000 \\ \underline{21900} \\ 100 \end{array}$$

$$\begin{array}{r} 6083 : 19 : 84 \\ 6083 \overline{) 207150} \\ \underline{414320} \\ 6083 \overline{) 4350360} \quad (7.15) \\ \underline{42581} \\ 92284 \\ \underline{6083} \\ 31436 \\ \underline{30415} \\ 10150 \\ \underline{6083} \end{array}$$

$$\begin{array}{r} 6083 : 7341 : 27 \\ 6083 \overline{) 197507} \quad (33 \text{ Ans}) \\ \underline{18249} \\ 15017 \\ \underline{18249} \end{array}$$

$$\begin{array}{r} 6083 : 22524 : 40 \\ 6083 \overline{) 900960} \quad (148 \text{ Ans}) \\ \underline{6083} \\ 29212 \\ \underline{24332} \\ 48780 \\ \underline{48584} \end{array}$$

$$\begin{array}{r} 6083 : 120000 : 80 \\ 6083 \overline{) 9600000} \quad (1578.1) \\ \underline{6083} \\ 35170 \\ \underline{30415} \\ 467550 \\ \underline{42611} \\ 49370 \\ \underline{48664} \\ 7060 \\ \underline{6083} \end{array}$$

906

$$\begin{array}{r} 296219 \quad 25416089 \\ \underline{254} \\ 118487 \\ \underline{1481095} \\ 592134 \\ 6083 \overline{) 75239226} \quad (12368.8) \\ \underline{6083} \\ 14409 \\ \underline{12168} \\ 2249 \\ \underline{36498} \\ 53748 \\ \underline{48664} \\ 50820 \\ \underline{48664} \\ 2156 \end{array}$$

$$\begin{array}{r} 12083 : 173397 : 1102 \\ 12083 \overline{) 346794} \\ \underline{173397} \\ 6083 \overline{) 17686494} \quad (2995) \\ \underline{12166} \\ 58204 \\ \underline{54747} \\ 45794 \\ \underline{42581} \\ 32130 \\ \underline{30415} \\ 1715 \end{array}$$

CASE 5

1 What is principal being put to interest for 12 years at 6 per cent per annum will amount to

$$\begin{array}{r} 12 \\ 2752872 \\ \underline{100} \\ 172 : 100 : 275200 \\ 172 \overline{) 275200} \quad (1600) \\ \underline{172} \end{array}$$

3 Received 728 as payment in full for a note with 5 years interest thereon at 6 per cent per annum for how much is the note given

$$\begin{array}{r} 60 \\ 360 \\ \underline{100} \\ 1350 : 100 : 72800 \\ 1350 \overline{) 728000} \quad (560 \text{ Ans}) \\ \underline{6500} \\ 7800 \end{array}$$

John

Simple Interest By Wm H. M.

CASE 6

2 Paid 858 in full for a note for 650 with 4 years interest due thereon what was the rate per cent charged on

$$\begin{array}{r} \text{paid note } 858 \\ 650 \\ \hline 208 \\ 3600 \div 208 = 100 \end{array}$$

3 At what rate per cent on this bond the following pay will 600 amount to 2752 in 12

$$\begin{array}{r} 2752 \\ 600 \\ \hline 1152 \\ 19200 \div 1152 = 100 \end{array}$$

CASE 7

2 In what time will 650 amount to 910 at 8 per cent

$$\begin{array}{r} 910 \\ 650 \\ \hline 260 \\ 5200 \div 260 = 20 \end{array}$$

3 In what time will 1600 amount to 2080 at 8 per cent

$$\begin{array}{r} 2080 \\ 1600 \\ \hline 480 \\ 7600 \div 480 = 15 \end{array}$$

1 A has B's note for 1000 dated Jan 1816 payable in 18 months with the interest from the date at 6 per cent on which the following payments are endorsed

$$\begin{array}{r} 100000 \\ 300 \\ \hline 1020 \\ 230 \\ \hline 890 \\ 211 \\ \hline 825 \\ 300 \\ \hline 5211 \end{array}$$

1 A bond was given by B to C for 2000 payable in 2 years with interest from date dated July 1, 1815

$$\begin{array}{r} \text{Oct 1816 } 11508 \\ \text{Jan 1, 1817 } 6208 \\ \hline 2400 \\ 1500 \\ \hline 1050 \\ 620 \\ \hline 430 \\ 19655 \\ 62055 \end{array}$$

MUSC

Compound Interest

RULE, W, H

1 What is the compound interest
of 500 for 3 years at 6 per cent

$$\begin{array}{r}
 500 \\
 \hline
 3000 \\
 500 \\
 \hline
 5300 \\
 6 \\
 \hline
 3180.00 \\
 530 \\
 \hline
 56180.00 \\
 6 \\
 \hline
 3370.80 \\
 561.80 \\
 \hline
 59550.8 \\
 500 \\
 \hline
 95508 \text{ Ans}
 \end{array}$$

2 What is the amount of 1500\$
for 5 years at 5 per cent

$$\begin{array}{r} 127628 \\ 1500 \\ \hline 63814000 \\ 127628 \\ \hline 191442000 \text{ cons} \end{array}$$

4. What is the compound interest of \$45.00 for 16 years at 6 per cent

$$\begin{array}{r}
 254035- \\
 - \quad 21500 \\
 \hline
 1270185-00 \\
 1016140 \\
 \hline
 11413157500 \\
 21-00- \\
 \hline
 6431575-
 \end{array}$$

Has B's note for 650 \$ payable
at the end of ~~the~~ 20 years at 6 per
cent compound interest what
sum will it require to discharge
the note at the expiration of
the given time

$$\begin{array}{r} 320713 \\ 650 \\ \hline 16035650 \\ 1924278 \\ \hline 208463450 \text{ dms} \end{array}$$

6 A father left a legacy of
8000 £ at compound interest
6 per cent to be equally divide
among his three sons when
the youngest who was 4 year
old should arrive at the age
of 21 what will be on each
ones share

2692778000
3) 2154216000
7180672

Insurance And Commis

2 1050.00 at 15 per cent

$$\begin{array}{r} 16750 \\ 8250 \\ 1650 \\ 825 \\ \hline 25525 \end{array}$$

$$\begin{array}{r} 3 \quad 41500 \\ 25 \\ \hline 22500 \\ 9000 \\ \hline 112500 \end{array}$$

4 What sum must be taken out for to cover 9000 when the premium is 10 per cent

$$\begin{array}{r} 100 \\ 90 : 100 : 9000 \\ \hline 9000 \\ 90 : 90000 \\ \hline 10000 \end{array}$$

5 What sum will it require per lb deducting from it to cover a policy of insurance for 45000 at 8 per cent

$$\begin{array}{r} 100 \\ 25 \\ \hline 75 : 100 : 45000 \\ \hline 45000 \\ 45 : 450000 \\ \hline 45000 \end{array}$$

6 What sum will it require to cover a policy of insurance for 5500 at 9 per cent

$$\begin{array}{r} 100 \\ 91 : 100 : 5500 \\ \hline 5500 \\ 91 : 55000 \\ \hline 55000 \\ 140 \\ 91 \\ \hline 490 \\ 455 \\ \hline 350 \\ 273 \\ \hline 770 \\ 728 \\ \hline 52 : 5200 \\ \hline 912 \end{array}$$

2 What is the commission on 1200 at 6 per cent

$$\begin{array}{r} 1200 \\ 6 \\ \hline 7200 \end{array}$$

3 2550 at 3 per

$$\begin{array}{r} 2550 \\ 3 \\ \hline 7650 \end{array}$$

4 26342 at 3 per

$$\begin{array}{r} 26342 \\ 3 \\ \hline 79026 \end{array}$$

5 6422 at 3 per

$$\begin{array}{r} 6422 \\ 3 \\ \hline 19266 \\ 48155 \text{ Ans} \end{array}$$

7 A comission merchant has received 41200 with instructions to rest it in salt at 8 per cent how many lbs of salt can he purchase

$$\begin{array}{r} 100 \\ 103 : 100 : 41200 \\ \hline 41200 \\ 103 : 412000 \\ \hline 412000 \\ 8 : 412000 \\ \hline 51500 \text{ Ans} \end{array}$$

2 What is the brokerage of 16250 at 50 cent at 0.5 per cent

$$\begin{array}{r} 16250 \\ 50 \\ \hline 812500 \\ 48750 \\ \hline 54183 \end{array}$$

3 1800 at 2.5 per cent

$$\begin{array}{r} 1800 \\ 2.5 \\ \hline 4500 \end{array}$$

4 5600 at 6 per cent

$$\begin{array}{r} 5600 \\ 6 \\ \hline 33600 \text{ Ans} \end{array}$$

Bearter Or Discount By w.

$$\begin{array}{r} 2 \quad 1500 \\ \quad 110 \\ \hline 15000 \\ 1500 \\ \hline 16500 \text{ Ans} \end{array}$$

$$\begin{array}{r} 3 \quad 1686 \\ \quad 128 \\ \hline 181488 \\ 8342 \\ \hline 1686 \\ \hline 215808 \text{ Ans} \end{array}$$

$$\begin{array}{r} 4 \quad 25000 \\ \quad 108 \\ \hline 200000 \\ 25000 \\ \hline 2700000 \text{ Ans} \end{array}$$

$$\begin{array}{r} 5 \quad 1260 \\ \quad 90 \\ \hline 11310 \text{ Ans} \end{array}$$

$$\begin{array}{r} 6 \quad 9254 \\ \quad 84 \\ \hline 37016 \\ 74032 \\ \hline 747336 \text{ Ans} \end{array}$$

$$\begin{array}{r} 7 \quad 1518 \\ \quad 834 \\ \hline 4554 \\ 12144 \\ \hline 125994 \\ 1138 \\ \hline 127132 \frac{1}{2} \text{ Ans} \end{array}$$

RULE

2 What is the present worth of 2460 \$ due 1 year and 6 months hence discounting at the rate of 8 per cent per annum

$$\begin{array}{r} 100 \\ 12 \\ \hline 112 : 100 :: 2464 \\ 112 \overline{) 246400} \\ \underline{224} \\ 224 \\ \underline{224} \\ 00 \end{array}$$

3 A has B's note for 1854.50 etc payable 8 months after date what is the present worth of said note discounting at the rate 5 1/2 per cent

$$\begin{array}{r} 5 \frac{1}{2} \\ 12 \overline{) 44} \\ \underline{36} \\ 8 \\ 100 \\ \hline 103.6666 : 100 : 1854.5000 \\ \hline 1036666 \overline{) 18545000} \\ \underline{1036666} \\ 81783340 \\ \underline{81783340} \\ 0 \\ \hline 8272228 \end{array}$$

4 What is the discount reduction must be made for prompt payment of a note for 650 \$ due 2 years hence 7 per cent per annum being allowed for discount

$$\begin{array}{r} 7 \\ 12 \overline{) 168} \\ \underline{14} \\ 28 \\ 100 \\ \hline 114 : 100 : 650 \\ 114 \overline{) 65000} \\ \underline{570} \\ 800 \\ \underline{798} \\ 200 \\ \underline{114} \\ 65000 \\ 57017 \\ \hline 7983 \end{array}$$

Equation Of Payments By

2 A merchant bought has owing to him from his friend the sum of 300 \$ to be paid as follows viz. 500 \$ at 2 months 1000 \$ at 5 months and the rest at 8 months how much longer than three months may be justice defer payment of the whole what will the payment be the mean time of payment

$$\begin{array}{r}
 500 \times 2 = 1000 \\
 1000 \times 5 = 5000 \\
 1500 \times 8 = 12000 \\
 \hline
 3000 \quad) \quad 18000 \quad \text{Ans}
 \end{array}$$

3 A buys of 650 acres of land for which he agrees to pay 1000 dollars at the following time viz. 200 dollars at 5 months 800 dollars at 8 months and the rest at 10 months but an equation of payments is afterwards agreed upon when must the payment be made

$$\begin{array}{r}
 200 \times 5 = 1000 \\
 800 \times 8 = 6400 \\
 500 \times 10 = 5000 \\
 \hline
 1000 \quad) \quad 12400 \quad \text{Ans}
 \end{array}$$

4 C owes D 1100 dollars to be paid in 3 months but D being in want of money C pays him 400 \$ at expiration of 2 months how much longer than three months may be justice defer payment of the whole what will the payment be the mean time of payment

$$\begin{array}{r}
 1000 \times 2 = 2000 \\
 400 \times 4 = 1600 \\
 \hline
 1400 \quad) \quad 3600 \quad \text{Ans}
 \end{array}$$

Single Fellowship

W. RULE

A has 320 lb of salt at 18 cts per lb for which B agrees to pay him 160\$ in cash

3 Three merchants enter into partner ship in trade of advances 7500\$ B 6000\$ and C 4500\$ with this they gained 4500\$ what was each partners share

$$\begin{array}{r} 7500 \\ 6000 \\ 4500 \\ \hline 18000 \end{array} : 4500 = 5400 : 5400$$

$$\begin{array}{r} 1800 : 5400 : 6000 : 4500 \\ 18 \overline{) 3240000} \quad (1800 \text{ cts}) \\ \underline{18} \\ 600000 \\ \underline{600000} \\ 0 \end{array}$$

$$\begin{array}{r} 1800 : 5400 : 4500 \\ \hline 18000 \\ 22500 \end{array}$$

$$\begin{array}{r} 18 \overline{) 225000} \quad (12500 \text{ cts}) \\ \underline{18} \\ 45000 \\ \underline{45000} \\ 0 \end{array}$$

3 A bankrupt is indebted to A 1200\$ to B 500\$ 37 cts to C 400\$ 40 cts to D 228\$ and his estate is worth but 2048\$ 75 cts how much does he pay per cent and how much is each creditor to receive

$$\begin{array}{r} 1200 \\ 500 \\ 400 \\ 228 \\ \hline 2728 \end{array} : 204875 = 100$$

$$\begin{array}{r} 2728 \overline{) 20487500} \quad (75 \text{ cts}) \\ \underline{19104} \\ 13845 \end{array}$$

$$\begin{array}{r} 272800 : 204875 : 129129 \\ \hline 129129 \\ 614025 \\ 409350 \\ 204875 \\ 84205 \\ 409350 \\ 204875 \end{array}$$

$$\begin{array}{r} 272800 : 204875 : 129129 \\ \hline 2458100 \\ 1867250 \\ 1697400 \end{array} \quad (968112 \text{ cts})$$

$$\begin{array}{r} 2298500 \\ 2183200 \end{array}$$

$$\begin{array}{r} 1153002 \\ 1491600 \end{array}$$

$$\begin{array}{r} 614025 \\ 545800 \end{array}$$

$$\begin{array}{r} 272800 : 204875 : 50084 \\ \hline 50084 \\ 1492425 \\ 614025 \\ 1023375 \end{array}$$

$$\begin{array}{r} 272800 : 204875 : 50084 \\ \hline 818700 \end{array} \quad (375 \text{ cts})$$

$$\begin{array}{r} 2054322 \\ 1910300 \end{array}$$

$$\begin{array}{r} 1440229 \\ 1364500 \end{array}$$

$$\begin{array}{r} 272800 : 204875 : 50084 \\ \hline 545800 \end{array}$$

$$\begin{array}{r} 2114950 \\ 1710300 \end{array}$$

Yellowship

By Wm. H.

$$271000:204675:7094$$

$$\begin{array}{r} 8187000 \\ 1847075 \\ 143785 \\ \hline 1701115 \end{array} \quad \begin{array}{r} 19444700 \\ 53209086 \\ \hline 136450 \end{array}$$

$$\begin{array}{r} 87464 \\ 81870 \\ \hline 55964 \end{array}$$

$$\begin{array}{r} 55964 \\ 54580 \\ \hline 1384 \end{array}$$

$$\begin{array}{r} 1384 \\ 135450 \\ \hline 299 \end{array}$$

$$\begin{array}{r} 272900:204675:228 \\ 228 \end{array}$$

$$\begin{array}{r} 1637400 \\ 1409350 \\ 1409350 \\ \hline 272904665900 \end{array} \quad \begin{array}{r} 171 \text{ Ans} \\ 2729 \\ 17375 \\ 17103 \\ \hline 2729 \\ 2729 \end{array}$$

4 Three men A B and C
Rent a farm 585 A and B
B at 6 dollars per year
Which a pays 180\$ B 195 and
C 225\$ and they agree that
the farm shall be divided
in proportion to the rents

$$\begin{array}{r} 180 \\ 195 \\ 225 \\ \hline 600:585=2=34:180 \end{array}$$

$$\begin{array}{r} 2342 \\ 40 \\ \hline 93714 \end{array}$$

$$\begin{array}{r} 93714 \\ 180 \\ \hline 5497120 \end{array}$$

$$\begin{array}{r} 93714 \\ 120 \\ \hline 6868520 \end{array}$$

$$\begin{array}{r} 486 \\ 480 \\ \hline 66 \end{array}$$

$$\begin{array}{r} 66 \\ 60 \\ \hline 252 \end{array}$$

$$\begin{array}{r} 252 \\ 240 \\ \hline 220 \end{array}$$

$$\begin{array}{r} 220 \\ 220 \\ \hline 220 \end{array}$$

$$600:585=2=34:195$$

$$\begin{array}{r} 2342 \\ 40 \\ \hline 93714 \end{array}$$

$$\begin{array}{r} 93714 \\ 180 \\ \hline 5497120 \end{array}$$

$$\begin{array}{r} 5497120 \\ 843128 \\ \hline 93714 \end{array}$$

$$\begin{array}{r} 93714 \\ 180 \\ \hline 5497120 \end{array}$$

$$\begin{array}{r} 5497120 \\ 274 \\ \hline 240 \end{array}$$

$$\begin{array}{r} 240 \\ 342 \\ \hline 310 \end{array}$$

$$\begin{array}{r} 310 \\ 423 \\ \hline 42 \end{array}$$

$$\begin{array}{r} 42 \\ 3 \\ \hline 3=1 \end{array}$$

$$600:585=2=34:225$$

$$\begin{array}{r} 2342 \\ 40 \\ \hline 93714 \end{array}$$

$$\begin{array}{r} 93714 \\ 225 \\ \hline 468570 \end{array}$$

$$\begin{array}{r} 468570 \\ 187428 \\ \hline 187428 \end{array}$$

$$\begin{array}{r} 187428 \\ 180 \\ \hline 308 \end{array}$$

$$\begin{array}{r} 308 \\ 300 \\ \hline 88 \end{array}$$

$$\begin{array}{r} 88 \\ 60 \\ \hline 256 \end{array}$$

$$\begin{array}{r} 256 \\ 240 \\ \hline 165 \end{array}$$

$$\begin{array}{r} 165 \\ 120 \\ \hline 157 \end{array}$$

$$\begin{array}{r} 157 \\ 45=3 \\ \hline 60=4 \end{array}$$

$$\begin{array}{r} 600:585=2=34:225 \\ 225 \\ \hline 1085650 \end{array} \quad \begin{array}{r} 435112 \\ 180 \\ \hline 308 \end{array} \quad \begin{array}{r} 308 \\ 300 \\ \hline 88 \end{array} \quad \begin{array}{r} 88 \\ 60 \\ \hline 256 \end{array} \quad \begin{array}{r} 256 \\ 240 \\ \hline 165 \end{array} \quad \begin{array}{r} 165 \\ 120 \\ \hline 157 \end{array} \quad \begin{array}{r} 157 \\ 45=3 \\ \hline 60=4 \end{array}$$

$$\begin{array}{r} 600:585=2=34:180 \\ 180 \\ \hline 2342 \end{array} \quad \begin{array}{r} 2342 \\ 40 \\ \hline 93714 \end{array} \quad \begin{array}{r} 93714 \\ 180 \\ \hline 5497120 \end{array} \quad \begin{array}{r} 5497120 \\ 843128 \\ \hline 93714 \end{array} \quad \begin{array}{r} 93714 \\ 180 \\ \hline 5497120 \end{array} \quad \begin{array}{r} 5497120 \\ 274 \\ \hline 240 \end{array} \quad \begin{array}{r} 240 \\ 342 \\ \hline 310 \end{array} \quad \begin{array}{r} 310 \\ 423 \\ \hline 42 \end{array} \quad \begin{array}{r} 42 \\ 3 \\ \hline 3=1 \end{array}$$

$$\begin{array}{r} 486 \\ 480 \\ \hline 66 \end{array} \quad \begin{array}{r} 66 \\ 60 \\ \hline 252 \end{array} \quad \begin{array}{r} 252 \\ 240 \\ \hline 220 \end{array} \quad \begin{array}{r} 220 \\ 220 \\ \hline 220 \end{array}$$

$$\begin{array}{r} 220 \\ 220 \\ \hline 220 \end{array}$$

$$\begin{array}{r} 220 \\ 220 \\ \hline 220 \end{array}$$

Fellowship By Wm Hampton H. Ch.

5 Three merchants freighted a ship 1200 barrels of powder of which 900 lb belonged to A 120 to B 480 to C but on account of stormy weather they were obliged to throw 900 lbs overboard how many lbs did each man lose

900
720
480

2100:900:960

2100 | 864000 | 4100
864

2100:900:720

2100 | 648000 | 3000
648

2100:900:480
900

2100 | 432000 | 2000
432

6 Three merchants join stock in trade A put 1200 & B 840 and C a certain sum and they gained in ten years time 825 of which C took his part 275 B required 800 and A part of the gain and how much stock C put in

1200
840
825
275
550

2100:550:1260
550
63000
63000
2100 | 693000 | 330
63
63

2100:950:840
840
4200
4200
2100 | 420000 | 2200
42
42
42

950:2100:275

275
550
550 | 547500 | 1050
55
275

7 Four men trade with a stock of 800 and they gained in ten years time as much C. and 400 over A's stock was 140 & B 260 & C 300 required D's stock and what each gained

800 140 800
900 260 2
100 300 1640
800

1640:1410

1410
85600

800 | 229600 | 287
287

800:1640:260

260
98400

3280
4126400
533000

800:1640:300

300
800 | 492000 | 615
615

800:1640:100

100
800 | 164000 | 205
205

Compound Fellowship

RULE WHMCO

2 Three merchants enter into partnership on the first of april a sum for 16 months a put into stock at first 600 £ and at the end of 8 m put in 200 £ more B put in at first 1200 £ at the end of 12 was obliged to take out 600 £ C put in at first 1000 £ and at the end of 12 m put in 800 £ more with this stock they gained 2300 £ what is each mans share

$$\begin{array}{r}
 600 \times 8 = 4800 \\
 800 \times 8 = 6400 \\
 \hline
 11200 \\
 1200 \times 10 = 12000 \\
 600 \times 6 = 3600 \\
 \hline
 15600 \\
 1000 \times 12 = 12000 \\
 800 \times 12 = 9600 \\
 \hline
 19200 \\
 11200 \\
 15600 \\
 19200 \\
 \hline
 46000 : 2300 : 11200 \\
 \hline
 384000 \\
 224000 \\
 \hline
 46000 \times 2576000 \quad (560 \text{ £}) \\
 230 \\
 \hline
 276 \\
 276 \\
 \hline
 0 \\
 4600 : 2300 : 11200 \\
 \hline
 468000 \\
 31200 \\
 \hline
 46000 \times 3588000 \quad (780 \text{ £}) \\
 322 \\
 \hline
 368 \\
 368 \\
 \hline
 46000 : 2300 : 19200 \\
 \hline
 576000 \\
 384000 \\
 \hline
 46000 \times 224000 \quad (960 \text{ £}) \\
 414 \\
 \hline
 276 \\
 276 \\
 \hline
 0
 \end{array}$$

3 A and B join stock in trade A put in 600 £ on the first January B advances which entitiled him to an equal share of the profit at the end of the year requires the sum B put in

$$\begin{array}{r}
 M \\
 12 \\
 \hline
 9:600:12 \\
 19 \\
 9 \overline{) 17200} \\
 80000 \text{ £} \\
 B
 \end{array}$$

4 I put in stock 1800 £ at the end of 12 months to advance such a sum at the end of the year will entitle him to an equal of the profit at the end of the year required the sum C put in

$$\begin{array}{r}
 12 \\
 11 \\
 \hline
 8:1800:12 \\
 12 \\
 8 \overline{) 21600} \\
 27000 \text{ £}
 \end{array}$$

5 Two gentlemen A and B hired a carriage to go to philad and return for 100 £ with liberty to take in two by the way when at philad they took in C and after wards 100 miles from philad to pittsburg they took in D Now allowing it to be 300 miles from philad to pittsburg and also that each man pay in proportion

Profit And RULE

2 Bought a piece of cloth for 18 and 20 cts per yard and sold it again for 18 50 cts a yard what is the gain percent

$$\begin{array}{r} 150 \\ 120 \\ \hline 120 : 180 : 1850 \\ 120 \overline{) 30000} \quad (25 \text{ cts}) \\ \underline{2400} \\ 600 \end{array}$$

3 Bought a piece of linen containing 42 yds for 218 and sold it at 65 cts per yd what is the gain or loss of the whole piece

$$\begin{array}{r} 42 \\ 66 \\ \hline 2772 \\ \underline{2100} \\ 672 \text{ Ans gain} \end{array}$$

4 A merchant bought 8 barrels of whiskey containing 32 gallons each for 968 while in his possession he lost 12 galls. in leakage the residue he sold for such a sum as gained him 128 on the whole how much per gallon did he buy and sell

$$\begin{array}{r} 32 \\ 6 \\ \hline 192 : 968 \\ 192 \overline{) 960} \quad (50 \text{ bought}) \\ \underline{960} \\ 0 \end{array}$$

$$\begin{array}{r} 192 \\ 12 \\ \hline 180 : 1108 : 1 \\ 180 \overline{) 1080} \quad (60 \text{ gain}) \\ \underline{1080} \\ 0 \end{array}$$

Loss

B 120 dozen of knives for 20 cts a piece and sold the again for 17 cts each what was the loss on the whole

$$\begin{array}{r} 172 \\ 1131 \overline{) 4443} \\ \underline{4320} \end{array}$$

7 Bought a chest of tea at 18 25 cts per lb but finding it to be of an inferior quality I am willing to lose 18 percent by it how must I sell it per lb

$$\begin{array}{r} 100 \\ 88 \\ \hline 100 : 82 : 125 \\ 82 \\ \hline 250 \\ 100 \overline{) 10250} \\ \underline{10000} \\ 2500 \end{array}$$

8 A merchant bought 2080 of stockings wool hats at 90 cts per hat at what rate must he sell the gain to gain 20 percent and how much must he gain on the whole

$$\begin{array}{r} 90 \\ 20 \\ \hline 100 : 1120 : 130 \\ 90 \\ \hline 100 \overline{) 1080} \\ \underline{1000} \\ 80 \\ 100 \overline{) 8200} \\ \underline{8000} \\ 200 \\ 1920 \\ \underline{2160} \\ 4320 \end{array}$$

Profit And Loss By Wm. H. H.

9 A trader bought a hogshead of rum of a certain proof containing 115 gallons at \$1.10 per gallon; how many gallons of water must be put into it to gain 5 dollars by selling it at \$1.16 per gallon Ans 16 1/2 gallons

$$\begin{array}{r} 118 \\ 100 \\ \hline 1:10:115 \\ 10 \\ \hline 100:1:1150 \\ 1150 \\ 50 \\ \hline 100:16.50 \\ 16 \frac{1}{2} \text{ Ans} \end{array}$$

10 A merchant Bought 4 cwt weight of coffee for 1348 40 cts and was afterwards obliged to sell it at 25 cts per lb what was his loss on the whole and how much on each pound

$$\begin{array}{r} 1448:13440:1 \\ 1448 \overline{)13440} \quad (30 \\ 13440 \\ \hline 8 \\ 5 \\ \hline 1:5:1448 \\ 22.4 \text{ Ans} \end{array}$$

11 If by selling 360 yds broad cloth 1728 there is gained 20 per cent profit what did it cost per yd

$$\begin{array}{r} 120:100:1728 \\ 120 \overline{)17280} \quad (1440 \\ 120 \\ \hline 528 \\ 480 \\ \hline 480 \\ \hline 480 \\ \hline 360:1440:1 \\ 360 \overline{)1440} \quad (4 \text{ Ans} \end{array}$$

12 A merchant laid out 1000 \$ on cloth at 4 per yds and sold it again at 7 cts per yd what was his whole gain

$$\begin{array}{r} 4:10:1000 \\ 4 \overline{)17000} \\ 2250 \text{ Ans} \end{array}$$

13 A sells a quantity of wheat at 18 per bushel and gains 20 per cent shortly afterwards he sold the same to the amount of 3785 cts and gained 50 per cent how many bushels were there in the last parcel and at what rate did he sell it

$$\begin{array}{r} 120:100:150 \\ 120 \overline{)11500} \\ 125 \\ \hline 8 \text{ B} \\ 125:100:3750 \\ 125 \overline{)3750} \quad (30 \text{ Ans} \end{array}$$

Barter, By William

14 A trader is about purchasing 5000 gallons of whiskey which he can have at 48 cts per gallon in ready money or 50 cts with 2 months credit or by borrowing the money at 8 per cent to pay the cash price

$$\begin{array}{r}
 \text{gal cts galls} \\
 1:48:5000 \quad 1:50:5000 \\
 \hline
 1 \overline{) 240000} \quad 1 \overline{) 250000} \\
 240000 \quad 250000 \\
 \hline
 0 \quad 0 \\
 2 \overline{) 19200} \quad 2 \overline{) 2432} \\
 3200 \quad 6800 \\
 \hline
 19200 \quad 6800 \\
 2400 \quad 6800 \\
 \hline
 2432 \quad 6800
 \end{array}$$

15 A butcher bought 12 head of beef cattle of equal weight for 2400 & which he sells for 40 cts per lb what ought each one to weigh that they may have the hide and tallow clear gain

$$\begin{array}{r}
 4:1:244 \\
 4 \overline{) 24000} \\
 12 \overline{) 6000} \\
 28 \overline{) 5000} \quad 17 \text{ lbs} \\
 28 \quad 4=1 \div 24 \quad 4 \\
 \hline
 226 \\
 196 \\
 \hline
 24
 \end{array}$$

Barter

I have 320 bushels of salt which B agrees to pay him 1008 in cash and the rest in coffee at 20 cts per lb how much coffee must I receive

$$\begin{array}{r}
 1:120:320 \\
 \hline
 170 \\
 6400 \\
 \hline
 320 \\
 38400 \\
 \hline
 100 \\
 2 \overline{) 22400} \\
 11200
 \end{array}$$

3 How much rye at 40 cts per bushel must be given for 208 bushels of wheat at 18 25 cts per bu

$$\begin{array}{r}
 40:28:225 \\
 \hline
 28 \\
 1000 \\
 250 \\
 70 \overline{) 3500} \\
 5000
 \end{array}$$

A barter 319 lb of coffee at 23 1/2 cts per lb with B for 250 yds of muslin what did the muslin cost A per yd

$$\begin{array}{r}
 1:23 \frac{1}{2}:319 \\
 \hline
 23 \frac{1}{2} \\
 959 \\
 638 \\
 159 \quad \text{Nearly} \\
 2 \overline{) 7496} \quad (29 \text{ m}) \\
 500 \\
 \hline
 2496 \\
 2250 \\
 \hline
 246
 \end{array}$$

Barter By Wm W. Mc

5 C has flour at 58 per boll which he barter to D at a profit of 20 per cent for tea which costs 18 25 cts per lb at what rate per cent must D sell the tea to make the barter equal

$$\begin{array}{r} 100 : 120 :: 125 \\ \hline 120 \\ 2500 \\ \hline 125 \\ 100 \overline{) 115000} \\ 81500 \text{ Ans} \\ \text{cts} \end{array}$$

6 A has cloth which cost him 28 50 cts per yd but in trade he must have 28 80 cts B has wheat at 18 20 cts per bushel at how much per bushel he sells to A to make the barter equal

$$\begin{array}{r} 250 : 280 :: 120 \\ \hline 120 \\ 5600 \\ \hline 280 \\ \text{Ans} \\ 250 \overline{) 33600} (134 \frac{2}{5} \\ 25 \\ \hline 86 \\ 75 \\ \hline 110 \\ 100 \\ \hline 10 \\ 25 \overline{) 10} = 2 \\ 25 \overline{) 25} = 1 \end{array}$$

7 B has 240 bushels of rye which cost him 20 cts per bushel this he barter with D at 95 cts per bushel for wheat which stands which stands at 99 cts per bu how many bushels of wheat is to receive in barter and at what price that the gain may be equal

$$\begin{array}{r} 10 : 75 :: 99 \\ \hline 495 \\ 891 \\ 90 \overline{) 9405} (104.5 \\ 90 \\ \hline 405 \\ 360 \\ \hline 450 \\ 450 \\ \hline 195 : 240 \\ \hline 1200 \\ 2160 \\ \hline 1045 : 1 : 22800 \\ 1045 \overline{) 22800} (21838 \\ 2090 \\ \hline 1900 \\ 1045 \\ \hline 8550 \\ 8360 \\ \hline 5 \overline{) 1900} = 38 \\ 5 \overline{) 1045} = 209 \end{array}$$

8 A gives B in Barter 25 lb 492 of cinnamon at 18 28 cts per lb for rice at 6 cts per lb how much rice must A receive

$$\begin{array}{r} 4 \overline{) 128} \\ 26 = 4 \\ \hline 768 \\ 256 \\ \hline 32 \\ \text{cts} \\ 4 \overline{) 13360} \\ 6 \overline{) 3360} \\ 28 \overline{) 560} \\ 4 \overline{) 20} = 5 \text{ dts} \end{array}$$

Rule

Exchange By W. H. M.

1 C and D barten C has mullen that cost him 22 cts per yd and he puts it at 25 cts per yd D's cost him 28 cts per yd at what price must he put it to gain 10 per cent

$$\begin{array}{r} 22 : 25 :: 28 : x \\ 25 \overline{) 110} \\ 56 \\ 22 \overline{) 140} \end{array}$$

$$\begin{array}{r} 110 : 110 :: 31 \frac{2}{11} : x \\ 110 \overline{) 350} \\ 140 \\ 110 \overline{) 385} \end{array}$$

10

A buys 250 bbls of flour flour from B at 68 25 cts per bbl in payment B takes 12 cts of coffee at 30 cts per lb 6 cts of tea at 18 75 cts per lb 25 yds of broad cloth at 68 per yd 20 68 10 cts in cash the rest in salt at 8 cts per bbl how many bbls of salt must B receive

116 25 250	116	50 964
250	28	25 432
3125	128	112
1250	32	25
156250	25 448	25
60250	55 112	150
96000	22	
	13440	
	142	
	150	8 11960
	20610	8 980
60250		120

Exchange

2 What is the value of 256 lb new york currency in pennsylvania

$$\begin{array}{r} 8 : 7 :: 6 : 5.6 \\ 12 \overline{) 96} \end{array}$$

3 How much south carolina is equal to 1500 lb of new jersey

$$\begin{array}{r} 8 : 6 :: 4 : 5.33 \\ 12 \overline{) 96} \end{array}$$

4 What sum new york currency is equal to 180 lb in massachusetts

$$\begin{array}{r} 9 : 6 :: 180 : 360 \\ 12 \overline{) 96} \end{array}$$

Exchange Continued

1 A bill of exchange
How much Virginia currency
will purchase a bill for 2800
South Carolina

$$\begin{array}{r}
 \$ 2800 \\
 4 = 8:6:280 \\
 12 \overline{) 336} \quad 20 \\
 56 \overline{) 72} \quad 5600 \\
 \quad 12 \\
 \quad 67200 \\
 \quad 72 \\
 \quad 134400 \\
 \quad 1176400 \\
 56 \overline{) 14838400} \quad 1286400 \\
 \quad 448 \quad 291200 \\
 \quad 358 \\
 \quad 336 \\
 \quad 224 \\
 \quad 224 \\
 \quad 00
 \end{array}$$

6 A bill of exchange being
remitted from Rhode Island
to South Carolina for 3000 what
is its value in the currency of the latter

$$\begin{array}{r}
 6:11=8:11304 \\
 12 \overline{) 12} \quad 20 \\
 72 \overline{) 56} \quad 6086 \\
 \quad 12 \\
 \quad 72960 \\
 \quad 56 \\
 \quad 437760 \\
 \quad 364800 \\
 72 \overline{) 4085760} \quad 1256445 \\
 \quad 360 \quad 204728=10\frac{1}{2} \\
 \quad 485 \quad 236=8-1000 \\
 \quad 432 \quad \text{lb } \$ \\
 \quad 537 \\
 \quad 504 \\
 \quad 336 \\
 \quad 288 \\
 \quad 480 \\
 \quad 432 \\
 \quad 48 \\
 \quad 4 \\
 72 \overline{) 192} \quad 2 \\
 \quad 144 \\
 \quad 48
 \end{array}$$

2 Change 37 10 Pennsylvania currency
to dollars

$$\begin{array}{r}
 37 = 10 \\
 20 \\
 15 \overline{) 75} \quad 5 \\
 15 \overline{) 150} \quad 100 \text{ cts}
 \end{array}$$

4 A bill of exchange for
468 lb 19s. 6d Virginia currency
is remitted to Philadelphia
what is the value in Federal
money

$$\begin{array}{r}
 468 = 19 = 6 \\
 12 \overline{) 20} \\
 9379 \\
 12 \overline{) 18758} \\
 156325 \text{ cts}
 \end{array}$$

5 A merchant deposited
in the United States branch
bank at Pittsburgh the sum
750 lb 10s Pennsylvania currency
for what sum may be drawn
for in Federal money

$$\begin{array}{r}
 750:10 \\
 7=6 \\
 20 \\
 15 \overline{) 15010} \\
 15 \overline{) 30020} \\
 200133\frac{1}{3} \text{ cts}
 \end{array}$$

$20 \times 40 = 200$
 $30 \times 15 = 450$
 $40 \times 25 = 1000$

 $90 \quad 90 \overline{) 1650} \quad 18\frac{2}{5} \text{ tons}$
 $\underline{90}$
 750
 $\underline{720}$
 30

 $30 \overline{) 300} = 10$
 $\underline{300}$
 0

Alligation By W. H. C.

3 A trader mixed 10 bushels of salt at 150 cts 20 at 160 cts and 30 at 170 cts per bushel at what rate can he afford to sell one bushel of this mixture

$$\begin{array}{r} 10 \times 150 = 1500 \\ 20 \times 160 = 3200 \\ 30 \times 170 = 5100 \\ \hline 60 \overline{) 9800} \\ 1633 \text{ Ans} \end{array}$$

4 If 4 oz of silver at 75 cts per oz be melted with 8 oz at 60 cts per oz what is the value of one oz of this mixture

$$\begin{array}{r} 4 \times 75 = 300 \\ 8 \times 60 = 480 \\ \hline 12 \overline{) 780} \\ 65 \text{ Ans} \end{array}$$

Case 2 and

How many galls of wine at 35 and 68 per gallon must be mixed together that one gallon may be worth 48

$$\begin{array}{r} 3 \quad 2 \times 1 = 3 \\ 4 \overline{) 3} \quad 1 = 1 \\ \quad 1 = 1 \end{array}$$

3 How many bushels of rye at 40 cts per bushel and corn at 30 cts must be mixed with ^{oats} at 20 cts to make a mixture worth 25 cts

$$\begin{array}{r} 15 \times 5 = 6 \\ 5 \quad 5 = 6 \text{ (Ans)} \\ 5 \quad 24 \end{array}$$

4 A grocer has four sorts of tea viz one kind at 120 cts another at 110 cts another 90 cts and another at 80 cts per lb how much of each sort must be taken to make a mixture worth one dollar per lb

$$\begin{array}{r} 100 \overline{) 120} \quad 2 = 2 \\ \quad 110 \quad 1 = 1 \\ \quad \quad 90 \quad 1 = 1 \\ \quad \quad \quad 80 \quad 2 = 2 \end{array} \text{ Ans}$$

$$\begin{array}{r} 100 \overline{) 120} \quad 1 \\ \quad 110 \quad 2 \\ \quad \quad 90 \quad 2 \\ \quad \quad \quad 80 \quad 1 \end{array} \text{ Ans}$$

$$\begin{array}{r} 100 \overline{) 120} \quad 2 \times 1 = 3 \\ \quad 110 \quad 1 = 1 \\ \quad \quad 90 \quad 2 \times 1 = 3 \\ \quad \quad \quad 80 \quad 2 = 2 \end{array} \text{ Ans}$$

$$\begin{array}{r} 100 \overline{) 120} \quad 2 \times 1 = 3 \\ \quad 110 \quad 2 \times 1 = 2 \\ \quad \quad 90 \quad 2 = 2 \\ \quad \quad \quad 80 \quad 1 \times 2 = 3 \end{array} \text{ Ans}$$

$$\begin{array}{r} 100 \overline{) 120} \quad 9 = 1 \\ \quad 110 \quad 2 \times 1 = 3 \\ \quad \quad 90 \quad 2 \times 1 = 3 \\ \quad \quad \quad 80 \quad 1 = 1 \end{array} \text{ Ans}$$

$$\begin{array}{r} 100 \overline{) 120} \\ \quad 110 \\ \quad \quad 90 \\ \quad \quad \quad 80 \end{array}$$

Migation By W H M

2 How much wheat at 48 cts rye at 36 cts and barley at 30 cts per bush must be mixed with 24 bu of oats at 18 cts per bush and the whole may rate at 22 cts per bush

$$\begin{array}{r}
 22 \overline{) 48} \quad 4 = 44 \\
 \underline{44} \\
 4 \\
 22 \overline{) 36} \quad 4 = 44 \\
 \underline{44} \\
 0 \\
 22 \overline{) 30} \quad 4 = 44 \\
 \underline{44} \\
 0 \\
 22 \overline{) 18} \quad 4 = 44 \\
 \underline{44} \\
 0
 \end{array}$$

26 x 148 = 48

148 : 24 : 4

48) 96 (2

96

3 How much gold at 16 20 24 carats fine and how much alloy must be mixed with 10 oz of 18 carats fine that the composition

$$\begin{array}{r}
 22 \overline{) 24} \quad 22 \times 11 + 2 = 34 \\
 \underline{22} \\
 2 \\
 22 \overline{) 20} \quad 2 = 22 \\
 \underline{22} \\
 0 \\
 22 \overline{) 16} \quad 2 = 22 \\
 \underline{22} \\
 0 \\
 22 \overline{) 12} \quad 2 = 22 \\
 \underline{22} \\
 0
 \end{array}$$

2 : 16 : 2

2 : 10 : 2

2 : 12 : 2

2 : 4 : 2

2 : 16 : 34

2 : 10 : 2

2 : 12 : 2

2 : 4 : 2

2 : 16 : 34

2 : 10 : 2

2 : 12 : 2

2 : 4 : 2

1 How much gold of 15 of 17 an of 18 an of 22 carats fine must be mixed together to form a mixture of 40 oz of 20 carats fine

$$\begin{array}{r}
 20 \overline{) 22} \quad 2 + 3 + 5 = 10 \\
 \underline{20} \\
 2 \\
 20 \overline{) 18} \quad 2 = 20 \\
 \underline{20} \\
 0 \\
 20 \overline{) 17} \quad 2 = 20 \\
 \underline{20} \\
 0 \\
 20 \overline{) 15} \quad 2 = 20 \\
 \underline{20} \\
 0
 \end{array}$$

16 : 40 : 2

16 : 80 : 5

16 : 40 : 10

16 : 40 : 16

16 : 40 : 25

16 : 40 : 15

3 How many gallons of water must be mixed with wine at 68 per gall to fill a vessel of 40 gall so that it may be sold without loss at 58 per gall

$$\begin{array}{r}
 5 \overline{) 6} \quad 6 : 40 : 1 \\
 \underline{5} \\
 1 \\
 5 \overline{) 40} \quad 6 : 40 : 1 \\
 \underline{40} \\
 0
 \end{array}$$

6 : 40 : 1

6 : 40 : 1

6 : 40 : 1

17.00

W D. M. ^{1.} ^m
Engraving Engraving
Aim at improvement in all you do

Aim at improvement in all you do W. H. M.

Aim at improvement ^{la} ^U ^{By}

Aim at improvement in

Aim at improvement in

Aim at improvement in at

Aim at improvement in

Aim at improvement

miscellaneous

W. H. M. ^{1.} ^m
A. J. H. ^{1.} ^m
A. J. H. ^{1.} ^m
A. J. H. ^{1.} ^m

Carpenters and joiners

omms

mag

Vulgar Fractions By Wm H. C. H.

Case 1

2 $\frac{144}{216}$ to its lowest terms fraction $5 \frac{144}{216}$
 $72 \overline{) 144} = 2$ Ans

3 Reduce $\frac{75}{125}$ to its lowest terms
 $25 \overline{) 75} = 3$ Ans

4 Reduce $\frac{4800}{10800}$ to its lowest terms
 $12 \overline{) 4800} = 4$ Ans
 $9 \overline{) 10800} = 12$

5 Reduce $\frac{94}{114}$ to its lowest terms
 $13 \overline{) 94} = 7$ Ans

6 Reduce $\frac{9876}{88884}$ to its lowest terms
 $9876 \overline{) 9876} = 1$ Ans
 $88884 \overline{) 88884} = 9$

Case 2

2 Reduce $12 \frac{15}{17}$ to an improper fraction
 $12 \frac{15}{17}$
 $21 \overline{) 17} = 1$ Ans

3 Reduce $183 \frac{21}{21}$ to an improper fraction
 $183 \frac{21}{21}$
 $183 \overline{) 366} = 2$ Ans
 $366 \overline{) 366} = 1$

4 Reduce $514 \frac{7}{16}$ to an improper fraction
 $514 \frac{7}{16}$
 $3084 \overline{) 514} = 1$ Ans
 $8227 \overline{) 16}$

5 Reduce $68425 \frac{3}{4}$
 $273703 \overline{) 68425} = 2$ Ans
 14

Case 3

2 Reduce $\frac{3848}{21}$ to its proper fraction
 $21 \overline{) 3848} = 183 \frac{5}{21}$ Ans
 $194 \overline{) 21}$
 $168 \overline{) 194} = 1$ Ans
 $68 \overline{) 63} = 1$ Ans
 $21 \overline{) 21} = 1$

3 Reduce $\frac{2465}{7}$ to its proper fraction
 $4 \overline{) 2465} = 352 \frac{1}{7}$ Ans

4 Reduce $\frac{961}{17}$ to its proper fraction
 $17 \overline{) 961} = 56 \frac{9}{17}$ Ans
 $85 \overline{) 111} = 1$ Ans
 $102 \overline{) 102} = 1$ Ans
 $17 \overline{) 17} = 1$

5 Reduce $\frac{8229}{16}$ to its proper fraction
 $16 \overline{) 8229} = 514 \frac{5}{16}$ Ans
 $80 \overline{) 22} = 2$ Ans
 $16 \overline{) 69} = 4$ Ans
 $64 \overline{) 64} = 1$ Ans
 $16 \overline{) 16} = 1$

Reduction of Vulgar Fractions

Case 4th

2nd Reduce $\frac{3}{4}, \frac{4}{5}, \frac{5}{6}$ to a common denominator

$$\begin{array}{r} 3+5+6=90 \\ 4+4+6=96 \\ 5+4+5=100 \\ 6+5+6=120 \end{array}$$

3rd Reduce $\frac{1}{3}, \frac{3}{4}, \frac{5}{6}$ to a common denominator

$$\begin{array}{r} 1+5 \times 15+9=675 \\ 3+3+15+9=1215 \\ 3+5+11+9=540 \\ 3 \times 5+15+5=1125 \\ 3 \times 5 \times 15+9=2025 \end{array}$$

Case 5th

2nd Reduce $\frac{2}{3}, \frac{3}{4}, \frac{4}{5}$ to the least common denominator

$$\begin{array}{r} 1215 \\ 18420 \\ 1215 \\ 2 \\ 10 \\ 4 \\ 40 \\ 3 \\ 120 = 40 \times 2 = 80 \\ 8 \\ 15 \times 3 = 45 \\ 12 \\ 12 \times 4 = 40 \\ 20 \\ 6 \times 5 = 30 \\ 80 \ 45 \ 40 \ 30 \\ 120 \ 120 \ 120 \ 120 \end{array}$$

3rd Reduce $\frac{1}{3}, \frac{3}{4}, \frac{5}{6}$ to the least common denominator

$$\begin{array}{r} 3 \ 4 \ 5 \\ 3 \ 5 \ 15 \ 9 \\ 5 \ 15 \ 9 \ 3 \\ 1 \ 1 \ 1 \ 3 \\ 15 \\ 3 \\ 45 = 15 \times 3 = 45 \\ 15 \\ 9 \times 3 = 27 \\ 9 \\ 3 \times 4 = 12 \\ 5 \times 5 = 25 \end{array}$$

$$\begin{array}{r} 15 \ 27 \ 12 \ 25 \\ 45 \ 45 \ 45 \ 45 \end{array}$$

Case 6th

2nd Reduce $\frac{7}{8}$ of $\frac{11}{6}$ of $\frac{9}{10}$ to a single fraction

$$\begin{array}{r} 7 \ 4 \ 9 \\ 8 \ 6 \ 10 \\ 7 \times 2 \ 9 \ 6 \ 126 = 21 \\ 8 \ 3 \ 10 \ 240 = 40 \end{array}$$

3rd Reduce $\frac{5}{7}$ of $\frac{4}{8}$ of $\frac{3}{11}$ to a single fraction

$$\begin{array}{r} 5 \ 4 \ 3 \\ 9 \ 8 \ 11 \\ (5 \times 2 + 3 = 30) \\ (9 \times 4 + 11 = 144) \end{array}$$

4th Reduce $\frac{5}{9}$ of $\frac{11}{7}$ of $\frac{11}{12}$ to a single fraction

$$\begin{array}{r} 5 \times 11 \times 11 = 605 \\ 9 \times 7 \times 12 = 756 = 189 \end{array}$$

Case 7th

2nd Reduce $\frac{11}{5}$ of a duet to the fraction of a lb Troy

$$\frac{11 \times 1 + 1}{5 \times 12 \times 20} = \frac{12}{1200} = \frac{1}{100}$$

3rd Reduce $\frac{7}{3}$ of a pt of wine to the fraction of a hhd

$$\frac{7 \times 1 + 1}{13 \times 2 \times 4 \times 63} = \frac{8}{6552} = \frac{1}{819}$$

4th Reduce $\frac{10}{11}$ of a minute to the fraction of a day

$$\frac{10 \times 1 + 1}{11 \times 60 \times 24} = \frac{11}{15840} = \frac{1}{1440}$$

Vulgar Fractions

William H. M.

By Wm H. M.

Case 8th

2 Reduce $\frac{300}{1000}$ of a lb troy to the fraction of awt (60)

$$\frac{1}{300} \times 12 = \frac{12}{300} = \frac{1}{25} = 4 \text{ Ans}$$

3 Reduce $\frac{1}{128}$ of a khd. to the fraction of a pt (56)

$$\frac{1}{128} \times 1 \times 1 \times 1 = \frac{1}{128} = \frac{1}{128} \text{ Ans}$$

4 Reduce $\frac{1}{1000}$ of a day to the fraction of a minute (144)

$$\frac{1}{1000} \times 60 \times 24 = \frac{144}{1000} = \frac{18}{125} \text{ Ans}$$

Case 9th

2 Reduce $\frac{3}{4}$ of a lb troy to its proper fraction 12 oz 1 lb troy

$$\frac{3}{4} \times 12 = 9 \text{ oz}$$

3 Reduce $\frac{4}{5}$ of a mile to its proper quantity 8 fur 1 Mile

$$\frac{4}{5} \times 10 = 8 \text{ fur}$$

4 Reduce $\frac{3}{10}$ of a day to its proper time 24 hours 1 day

$$\frac{3}{10} \times 24 = 7.2 \text{ hours}$$

5 Reduce What is the value of $\frac{4}{5}$ of a B

$$\frac{4}{5} \times 100 = 80 \text{ Ans}$$

Case 10

3 Reduce 31 galls 2 qt to the fraction of a khd

$$\frac{31 \times 4 + 2}{128} = \frac{126}{128} = \frac{63}{64} \text{ Ans}$$

4 Reduce 6 hundred weight 2 qr 18 $\frac{2}{3}$ lb to the fraction of a ton bwt gr lb

$$6 \times 2 = 12 \text{ cwt}$$

$$\frac{2}{4} \times 28 = 14 \text{ lb}$$

$$\frac{18 \times 2}{3} = 12 \text{ lb}$$

Case 11th

2 Reduce $\frac{17}{20}$ to a decimal

$$\frac{17}{20} = 0.85 \text{ Ans}$$

Addition of Vulgar Fractions

Case 1

2 Add $\frac{4}{25}, \frac{8}{25}, \frac{12}{25}, \frac{16}{25}, \frac{19}{25}$ together

$$\begin{array}{r} 4 \\ 8 \\ 12 \\ 16 \\ 19 \\ \hline 59 \\ 25 \overline{) 59} 2 \frac{9}{25} \text{ Ans} \\ \underline{50} \\ 9 \\ 25 \overline{) 9} 0 \frac{9}{25} \end{array}$$

3 Add $\frac{15}{60}, \frac{25}{60}, \frac{45}{60}, \frac{55}{60}$ together

$$\begin{array}{r} 15 \\ 25 \\ 45 \\ 55 \\ \hline 140 \\ 60 \overline{) 140} 2 \frac{2}{3} \text{ Ans} \\ \underline{120} \\ 20 \\ 60 \overline{) 20} \frac{1}{3} \end{array}$$

Case 2nd

2 Add $2\frac{1}{4}, 1\frac{1}{8}$ together

$$\begin{array}{r} 2 \frac{1}{4} \quad 1 \frac{1}{8} \\ \hline 2 \frac{2}{4} \quad 1 \frac{1}{8} \\ \hline 2 \frac{2}{4} \quad 1 \frac{1}{8} \\ \hline 3 \frac{3}{8} \\ \hline 40 \overline{) 33} 1 \frac{3}{40} \text{ Ans} \\ \underline{40} \\ 3 \end{array}$$

3 Add $\frac{4}{5}, \frac{5}{6}, \frac{6}{7}, \frac{3}{8}, \frac{8}{15}$ together

$$\begin{array}{r} 4 \quad 5 \quad 6 \quad 3 \quad 8 \\ 5 \overline{) 56781} \\ 3 \overline{) 16783} \\ 2 \overline{) 112481} \\ \hline 1 \quad 1 \quad 7 \quad 4 \quad 1 \end{array}$$

$$\begin{array}{r} 7 \\ \hline 28 \\ \hline 2 \\ \hline 56 \\ \hline 3 \\ \hline 168 \end{array}$$

$$\begin{array}{l} 5 \quad 840 = 168 + 11 = 672 \\ 6 \quad 140 + 5 = 100 \\ 7 \quad 120 + 6 = 126 \\ 8 \quad 105 + 8 = 315 \\ 15 \quad 56 + 8 = 118 \end{array}$$

$$\begin{array}{r} 840 \overline{) 2855} 3 \frac{168}{840} \\ \underline{2520} \\ 335 \\ 840 \overline{) 335} 0 \frac{67}{840} \end{array}$$

Case 3

3 Add $1\frac{2}{5}, \frac{4}{5}, 9\frac{3}{20}$ together

$$\begin{array}{r} 1 \frac{2}{5} \quad \frac{4}{5} \quad 9 \frac{3}{20} \\ \hline 1 \frac{2}{5} \quad \frac{4}{5} \quad 9 \frac{3}{20} \\ \hline 1 \frac{2}{5} \quad \frac{4}{5} \quad 9 \frac{3}{20} \\ \hline 11 \frac{6}{20} \quad 1 \frac{16}{20} \quad 9 \frac{3}{20} \\ \hline 22 \frac{25}{20} \quad 9 \frac{3}{20} \\ \hline 31 \frac{28}{20} \\ \hline 60 \overline{) 3128} 5 \frac{28}{60} = 5 \frac{7}{15} \end{array}$$

Vulgar Fraction By Wth

4 Add $1\frac{2}{3}$ $6\frac{7}{8}$ $\frac{2}{3}$ of $\frac{1}{2}$ $7\frac{1}{2}$ together

$$1\frac{2}{3} \quad 6\frac{7}{8} \quad \frac{2}{3} \text{ of } \frac{1}{2} \quad 7\frac{1}{2}$$

$$\frac{2 \times 1 = 2}{3 \times 2 = 6}$$

$$1\frac{2}{3}$$

$$\begin{array}{r} 9 \quad 7 \quad 1 \quad 1 \\ 2 \overline{) 10 \quad 8 \quad 3 \quad 2} \\ \underline{8} \quad \quad \quad \quad \\ 2 \quad \quad \quad \quad \\ \underline{2} \quad \quad \quad \quad \\ 0 \quad \quad \quad \quad \end{array}$$

$$\begin{array}{r} 313 \\ 16 \overline{) 126} \end{array}$$

$$\begin{array}{r} 10 \\ 8 \\ 3 \\ \hline 21 \end{array}$$

$$\begin{array}{r} 12 \quad 0 = 1219 = 668 \\ 15 \times 7 = 105 \\ 216 \times 1 = 216 \\ 66 \times 1 = 66 \\ \hline 313 \end{array}$$

Case 11th

2 Add $\frac{1}{2}$ of a yard to $\frac{2}{3}$ of a foot

$$\frac{1}{2} = \frac{1}{2}$$

$$\frac{2}{3} = \frac{2}{3}$$

$$0 = 8$$

$$\frac{1}{3}$$

$$3 \overline{) 24}$$

$$\frac{2}{3} = 2 \text{ Ans}$$

$$2 \overline{) 3}$$

$$\frac{1}{2} = \frac{1}{2}$$

$$2 \overline{) 12}$$

$$6$$

3 Add $\frac{1}{3}$ of a day to $\frac{1}{2}$ of an hour

$$3 \overline{) 24}$$

$$\frac{1}{2}$$

$$2 \overline{) 60}$$

$$8 = 30$$

$$\text{Ans}$$

4 Add $\frac{1}{3}$ of a week $\frac{1}{4}$ of a day and $\frac{1}{2}$ of an hour together

$$\frac{1}{3} \quad \frac{1}{4} \quad \frac{1}{2}$$

$$3 \overline{) 12}$$

$$2 = 8 = 0$$

$$6 = 36$$

$$2 = 14 = 30 \text{ Ans}$$

$$14 \overline{) 24}$$

$$2 \overline{) 60}$$

5 Add $\frac{7}{8}$ of a mile $\frac{2}{3}$ of a year and $\frac{1}{4}$ of a foot together

$$\frac{7}{8} \quad \frac{2}{3} \quad \frac{1}{4}$$

$$4 \overline{) 36}$$

$$2 \overline{) 6}$$

$$1540 = 0 = 0$$

$$0 = 2 = 0$$

$$0 = 6 = 9$$

$$1540 = 2 = 9$$

$$\text{Ans}$$

$$8 \overline{) 12320}$$

$$1540$$

Subtraction Of Vulgar Frae

Examples

from $\frac{4}{8}$
take $\frac{3}{8}$
 $\frac{4}{8} - \frac{3}{8} = \frac{1}{8}$ Ans

from $\frac{6}{7}$
take $\frac{4}{7}$
 $\frac{6}{7} - \frac{4}{7} = \frac{2}{7}$ Ans

3 from $\frac{2}{3}$
take $\frac{1}{4}$
 $\frac{2}{3} - \frac{1}{4} = \frac{5}{12}$ Ans

11 from $\frac{11}{12}$
take $\frac{1}{4}$
 $\frac{11}{12} - \frac{1}{4} = \frac{9}{12} = \frac{3}{4}$ Ans

5 from $\frac{5}{5}$
take $\frac{1}{5}$
 $\frac{5}{5} - \frac{1}{5} = \frac{4}{5}$ Ans

6 from $\frac{209}{72}$
take $\frac{144}{72}$
 $\frac{209}{72} - \frac{144}{72} = \frac{65}{72}$ Ans

397
432 Ans

15
16
11 15
12 16

12 $\frac{1}{2}$
6 $\frac{1}{2}$
5 $\frac{1}{2}$

2 | 5 1
12 2
6 1
2
12 12 = 125 = 5
2 6 1 = 6
12
12

from $13\frac{1}{4}$
take $8\frac{1}{4}$
 $13\frac{1}{4} - 8\frac{1}{4} = 5$ Ans

from $10\frac{1}{2}$
take $1\frac{1}{2}$
 $10\frac{1}{2} - 1\frac{1}{2} = 9$ Ans

from $19\frac{1}{2}$
take $1\frac{1}{2}$
 $19\frac{1}{2} - 1\frac{1}{2} = 18$ Ans

Multiplication of Vulgar

from $\frac{11}{3}$ from $15 - 6\frac{2}{3}$
 Take $15 - 5\frac{1}{5}$

$$\begin{array}{r} 26 \\ 7 \\ 9 \overline{) 1146} \\ 15 \quad 6 \quad 2 \\ 3 \quad 3 \\ \hline 15 = 315 \end{array}$$

from 7 weeks
 Take $9\frac{11}{10}$ days

$$\begin{array}{r} 24 \\ 10 \overline{) 168} \\ 16 = 168 \end{array}$$

$$\begin{array}{l} 7 = 0 = 0 = 0 \\ 0 = 9 = 16 = 118 \\ 5 \quad 4 = 7 = 12 \end{array}$$

Section 4

3 Multiply $\frac{3}{8}$ by $\frac{11}{5}$

$$\begin{array}{r} 3 + 11 = 14 \\ 8 + 5 = 13 \end{array} \quad \begin{array}{r} 12 = 3 \\ 110 = 10 \end{array} \text{ Ans}$$

4 Multiply $\frac{2}{5}$ of $\frac{3}{4}$ by $\frac{1}{2}$

$$\begin{array}{r} 2 + 3 + 1 = 6 = 3 \text{ Ans} \\ 5 + 4 + 2 = 11 = 20 \end{array}$$

5 Multiply $7\frac{1}{2}$ by $\frac{1}{4}$

$$\begin{array}{r} 7\frac{1}{2} \\ 2 \\ 15 + 1 = 16 \\ 2 + 4 = 8 \overline{) 112} \end{array} \quad \begin{array}{r} 14 \\ 8 \\ 7 \\ 8 \end{array} \text{ Ans}$$

6 Multiply $\frac{3}{4}$ of 9 by $\frac{2}{3}$

$$\begin{array}{r} 3 + 9 = 27 \\ 4 + 1 = 11 \\ 27 + 7 = 189 \\ 4 + 8 = 32 \overline{) 189} \end{array} \quad \begin{array}{r} 5 \quad 29 \\ 32 \end{array} \text{ Ans}$$

Multiply $48\frac{3}{5}$ by $10\frac{5}{6}$

$$\begin{array}{r} 48\frac{3}{5} \\ 10\frac{5}{6} \\ \hline 243 \\ 5 \end{array} \quad \begin{array}{r} 18\frac{5}{6} \\ 6 \\ 83 \\ 6 \end{array}$$

$$\begin{array}{r} 243 + 83 = 326 \\ 5 = 6 = 30 \overline{) 20169} \\ 180 \\ 216 \\ 210 \\ 69 \\ 60 \\ 3 \overline{) 90} \\ 30 = 10 \end{array}$$

Division of Vulgar

3 Divide $\frac{17}{21}$ by $\frac{3}{8}$

$$\begin{array}{r} 3 + 7 = 10 \text{ Ans} \\ 8 + 6 = 14 \end{array}$$

Divide $\frac{17}{21}$ by $\frac{3}{8}$

$$\begin{array}{r} 17 + 5 = 22 \\ 21 + 8 = 29 \overline{) 85} \end{array} \quad \begin{array}{r} 122 \\ 63 \\ 60 \\ 22 \\ 63 \end{array}$$

5 Divide $1\frac{1}{2}$ by $4\frac{8}{10}$

$$\begin{array}{r} 1\frac{1}{2} \\ 4\frac{8}{10} \\ 3 + 10 = 13 = 5 \text{ Ans} \\ 2 + 48 = 96 = 16 \end{array}$$

6 Divide $\frac{7}{8}$ by $\frac{1}{4}$

$$\begin{array}{r} \frac{7}{8} \\ \frac{1}{4} \\ 8 \overline{) 28} = 2 \\ 3 + 3 = 15 = 4 \text{ Ans} \\ 8 + 8 = 64 = 32 \end{array}$$

Rule Of Three In Vulgar

7 Divide $9\frac{1}{2}$ by $\frac{1}{2}$ of 4

$$\begin{array}{r} 9\frac{1}{2} \\ \underline{6} \\ 55+2 \\ \hline 6+7=42 \end{array} \quad \begin{array}{r} 1 \quad 7=7 \\ 2 \quad 1=2 \\ \hline 140 \\ 2 \quad 13 \\ \hline 221 \end{array} \quad \begin{array}{r} 13 \\ 221 \end{array} \quad \text{Ans}$$

$$\begin{array}{r} 2 \quad 26=13 \\ \hline 42=21 \end{array}$$

8th Divide $5205\frac{1}{5}$ by $\frac{4}{5}$ of 91

$$\begin{array}{r} 5205\frac{1}{5} \\ \hline 26026+5=130130 \\ \hline 5+364=1820 \end{array} \quad \begin{array}{r} 130130 \\ \hline 12940 \\ \hline 2730 \\ \hline 1820 \\ \hline 910 \end{array} \quad \begin{array}{r} 910 \\ \hline 910=1 \\ \hline 1820=2 \\ \hline 182 \end{array} \quad \text{Ans}$$

Single Rule Of Three in Vulgar fractions

2 If $\frac{3}{4}$ of a ton of iron cost 164 $\frac{3}{4}$ \$ what will $\frac{6}{7}$ of a ton come to

$$\begin{array}{r} 164\frac{3}{4} \\ \hline 49 \quad 3+3+6=8874 \\ \hline 3+2+7=42 \end{array} \quad \begin{array}{r} 8874 \\ \hline 84 \\ \hline 47 \\ \hline 42 \\ \hline 54 \\ \hline 42 \\ \hline 120 \\ \hline 84 \\ \hline 360 \\ \hline 336 \\ \hline 2 \quad 24=12 \\ \hline 42=21 \end{array} \quad \begin{array}{r} 21128\frac{2}{21} \\ \hline 84 \\ \hline 47 \\ \hline 42 \\ \hline 54 \\ \hline 42 \\ \hline 120 \\ \hline 84 \\ \hline 360 \\ \hline 336 \\ \hline 2 \quad 24=12 \\ \hline 42=21 \end{array} \quad \text{Ans}$$

3

A person having $\frac{3}{5}$ of a coal mine sells $\frac{1}{4}$ of his share for 1718 what is the value of the whole mine at the same rate

$$\begin{array}{r} 3:1718::\frac{1}{4}:x \\ \hline 3 \cdot 1718 = 5154 \\ \hline 5154 \div 4 = 1288.5 \end{array} \quad \begin{array}{r} 1718 \\ \hline 9 \quad 13 \quad 4 \quad 20 \\ \hline 380 \end{array} \quad \text{Ans}$$

4

At $\frac{5}{6}$ of a dollar per yd what will 42 yards come to

$$\begin{array}{r} 5+42+1=210 \\ \hline 6+1+1=8 \end{array} \quad \begin{array}{r} 210 \\ \hline 18 \\ \hline 35 \end{array} \quad \begin{array}{r} 8 \quad 210 \\ \hline 5 \quad 42+1 \\ \hline 6 \quad 1 \end{array} \quad \begin{array}{r} 35 \\ \hline 18 \\ \hline 30 \end{array} \quad \text{Ans}$$

5

A gentleman owing $\frac{2}{3}$ of a vessel sells $\frac{2}{5}$ of his share for 3128 what is the whole vessel worth

$$\begin{array}{r} 2:3128::\frac{2}{5}:x \\ \hline 2 \cdot 3128 = 6256 \\ \hline 6256 \div 5 = 1251.2 \end{array} \quad \begin{array}{r} 3128 \\ \hline 1568 \\ \hline 312 \\ \hline 4 \quad 4680 \\ \hline 81170 \end{array} \quad \text{Ans}$$

6

Of $1\frac{1}{2}$ bushels of apples cost 79 $\frac{3}{4}$ cts what will $3\frac{2}{3}$ bushels cost at the same rate

$$\begin{array}{r} 1\frac{1}{2}:79\frac{3}{4}::3\frac{2}{3}:x \\ \hline 1\frac{1}{2} \cdot 79\frac{3}{4} = 119.25 \\ \hline 119.25 \div 1\frac{1}{2} = 79.5 \end{array} \quad \begin{array}{r} 79\frac{3}{4} \\ \hline 4 \quad 3+238+177=12138 \\ \hline 4+3+5=60 \end{array} \quad \begin{array}{r} 12138 \\ \hline 120 \\ \hline 138 \\ \hline 126 \\ \hline 12 \\ \hline 6 \quad 18=3 \\ \hline 60=10 \end{array} \quad \text{Ans}$$

Inverse Proportion By Wth Hth

7 If $\frac{1}{8}$ of a ship be worth 175 £ 35 cts what part of her may be purchased for 6018 20 cts Ans $\frac{3}{7}$ Ans

$$\frac{8 \cdot 175 \cdot 35}{1 \cdot 6018} =$$

$$\frac{20440}{140280} = 3 \text{ Ans}$$

Rule,

1st If How much shall I buy 2 yds wide will line 4 1/2 yds of cloth 1 1/2 yds wide

$$\frac{1 \frac{1}{2} = \frac{3}{2}}{4 \frac{1}{2} = \frac{9}{2}} \quad \frac{3 \cdot 2 \cdot 2}{2 \cdot 2 \cdot 4} = \frac{6}{8} = \frac{3}{4}$$

2 If 6 1/2 hundred weight be carried 22 1/2 miles for 25 1/4 \$ B how far may 1 hundred weight be carried for the same money

$$\frac{6 \frac{1}{2} \cdot 22 \frac{1}{2} \cdot 1}{2} = \frac{7553}{2} = 3776 \frac{1}{2}$$

3 If 12 men can finish a piece of work in 37 1/2 days how long will it take 16 men to do the same work

4 A lends to B 100 £ for 6 1/2 months, what sum should B lend A for 3 1/2 years to requite his kindness

$$\frac{6 \frac{1}{2} \cdot 100 \cdot 3 \frac{1}{2}}{3 \cdot 100 \cdot 2} = \frac{46}{3}$$

$$\frac{20 \cdot 302}{37} = 1604 \frac{2}{3}$$

$$\frac{244 \cdot 122}{4111} = 207$$

5 How many feet long must a board be that is 3/8 of a foot wide to equal 7/8 of a foot long and 7/8 of a foot wide

$$\frac{7 \cdot 8 \cdot 20 \cdot 7}{8 \cdot 8 \cdot 2} = \frac{781}{2}$$

$$\frac{8 \cdot 41 \cdot 3 \cdot 981}{7 \cdot 2 \cdot 41 \cdot 56} = 17 \frac{4}{7} \text{ Ans}$$

6 In exchanging 20 1/2 yards of cloth of 1 1/4 yards wide for 30 1/2 of the same quality of 3/4 yards wide what quantity of the latter makes an equal barter

$$\frac{10 \cdot 20 \cdot 1}{4} = \frac{50}{1}$$

$$\frac{5 \cdot 41 \cdot 11}{4 \cdot 2 \cdot 9} = 24 \frac{1}{2} \text{ Ans}$$

Raising of Powers

1st What is the 3^d power of 15?
 $15 \times 15 = 225$
 $225 \times 15 = 3375$

2nd What is the 4th power of 35?

$$\begin{array}{r}
 35 \\
 35 \\
 \hline
 1225 \\
 1225 \\
 \hline
 42875 \\
 42875 \\
 \hline
 1500625 \\
 \hline
 1500625 \text{ Ans}
 \end{array}$$

3rd What is the 3^d power of 103?

$$\begin{array}{r}
 103 \\
 103 \\
 \hline
 30909 \\
 30909 \\
 \hline
 106069 \\
 106069 \\
 \hline
 1092727 \\
 \hline
 1092727 \text{ Ans}
 \end{array}$$

4th What is the 5th power of 029?

$$\begin{array}{r}
 029 \\
 029 \\
 \hline
 261 \\
 261 \\
 \hline
 0058 \\
 0058 \\
 \hline
 00841 \\
 00841 \\
 \hline
 7569 \\
 7569 \\
 \hline
 1682 \\
 1682 \\
 \hline
 000024389 \\
 000024389 \\
 \hline
 219501 \\
 219501 \\
 \hline
 0000048778 \\
 0000048778 \\
 \hline
 000000705281 \\
 \hline
 000000705281
 \end{array}$$

What is the 11th power of 3?

$$\begin{array}{r}
 3 \\
 3 \\
 \hline
 9 \\
 9 \\
 \hline
 27 \\
 27 \\
 \hline
 81 \\
 81 \\
 \hline
 2187 \\
 2187 \\
 \hline
 531441 \\
 531441 \\
 \hline
 177147 \\
 177147 \\
 \hline
 282429536481 \\
 \hline
 282429536481 \text{ Ans}
 \end{array}$$

W^h H^o M^o

Square Root Examples

By Wm H. Moore

1 What is the square root of 531441?

$$\begin{array}{r} 729 \text{ Ans} \\ 49 \overline{) 531441} \\ 142 \overline{) 414} \\ 284 \overline{) 13041} \\ 1449 \overline{) 13041} \end{array}$$

2 What is the square root of 106729?

$$\begin{array}{r} 327 \text{ Ans} \\ 9 \overline{) 106729} \\ 62 \overline{) 169} \\ 647 \overline{) 4529} \\ 4529 \end{array}$$

3 What is the square root of 4782969?

$$\begin{array}{r} 2187 \text{ Ans} \\ 4 \overline{) 4782969} \\ 41 \overline{) 78} \\ 428 \overline{) 3429} \\ 4367 \overline{) 3424} \\ 4367 \overline{) 36569} \\ 4367 \overline{) 36569} \end{array}$$

4 What is the square root of 4304169?

$$\begin{array}{r} 2074 \text{ Ans} \\ 36 \overline{) 4304169} \\ 125 \overline{) 704} \\ 1306 \overline{) 625} \\ 13121 \overline{) 7969} \\ 13121 \overline{) 7836} \\ 13121 \overline{) 13121} \end{array}$$

5 What is the square root of 387420489?

$$\begin{array}{r} 19683 \text{ Ans} \\ 1 \overline{) 387420489} \\ 29 \overline{) 287} \\ 386 \overline{) 261} \\ 3928 \overline{) 2642} \\ 39363 \overline{) 2316} \\ 3928 \overline{) 32604} \\ 39363 \overline{) 31424} \\ 39363 \overline{) 118689} \\ 39363 \overline{) 118689} \end{array}$$

6 What is the square root of 22071204?

$$\begin{array}{r} 4698 \text{ Ans} \\ 16 \overline{) 22071204} \\ 86 \overline{) 607} \\ 827 \overline{) 516} \\ 8398 \overline{) 4112} \\ 8398 \overline{) 8361} \\ 8398 \overline{) 75104} \\ 8398 \overline{) 75104} \end{array}$$

7 What is the square root of 36372961?

$$\begin{array}{r} 6031 \text{ Ans} \\ 36 \overline{) 36372961} \\ 1263 \overline{) 6031} \\ 1266 \overline{) 3729} \\ 1266 \overline{) 3609} \\ 1266 \overline{) 12061} \\ 1266 \overline{) 12061} \end{array}$$

8 What is the square root of 2268741?

$$\begin{array}{r} 1506,23 \text{ Ans} \\ 25 \overline{) 2268741} \\ 3006 \overline{) 126} \\ 30122 \overline{) 125} \\ 30122 \overline{) 18741} \\ 30122 \overline{) 18036} \\ 30122 \overline{) 70500} \\ 30122 \overline{) 60244} \\ 30122 \overline{) 1025400} \\ 30122 \overline{) 903729} \end{array}$$

Done

Square Root By Wm H. McCormick

10th What is the square root of 9712718051

Ans 985531
 188 1612
 1504

1965 10841
 9805
 19705 106680
 98525

197103 815556
 581306

11th What is the square root of 9712718050

Ans 3117218120 / 17810610

27 219
 189
 348 2821
 2784
 3561 3781
 3561
 3562 2202000
 2137236

12th What is the square root of 447525431

Ans 66921
 447525431 / 69247

129 1195
 1161

1382 3425
 2764

13844 66173
 57374

138489 1079910
 968409

13th What is the square root of 00008836

Ans 94
 00008836 / 94
 796
 796

Rule

1st What is the square root of 2304

Ans 48
 2304 = 48 = 2
 5184 = 7 = 3

2nd What is the square root of 2704

Ans 52
 2704
 169 1614
 1014
 4225
 338
 845
 845

3rd What is the square root of 15625

Ans 125
 15625 / 125

22 56
 44
 245 1225
 1225

46656 / 216 Ans

41 66
 41
 426 2556
 2556

Square Root By W. H. M.

1st What is the square root of 3 Rules

$$\begin{array}{r} 357 \\ 476 \end{array}$$

$$\begin{array}{r} 357 \\ 476 \overline{) 35700} \\ \underline{3332} \\ 2380 \\ \underline{2380} \end{array}$$

$$\begin{array}{r} 7.5 \\ 64 \overline{) 86602} \end{array} \text{Ans}$$

$$\begin{array}{r} 166 \overline{) 1100} \\ \underline{996} \end{array}$$

$$\begin{array}{r} 1726 \overline{) 10400} \\ \underline{10356} \end{array}$$

$$\begin{array}{r} 173262 \overline{) 440000} \\ \underline{346404} \end{array}$$

5 or

What is the square root of $\frac{478}{549}$

$$\begin{array}{r} 478 \\ 549 \overline{) 4780} \\ \underline{4398} \end{array}$$

$$\begin{array}{r} 3880 \\ 3843 \end{array}$$

$$\begin{array}{r} 3700 \\ 3294 \end{array}$$

$$\begin{array}{r} 4060 \\ 3849 \end{array}$$

$$\begin{array}{r} 2170 \\ 1647 \end{array}$$

$$\begin{array}{r} 5290 \\ 4941 \end{array}$$

$$\begin{array}{r} 2890 \\ 2745 \end{array}$$

$$\begin{array}{r} 8706739525 \overline{) 93308} \\ \underline{81} \end{array}$$

$$\begin{array}{r} 183 \overline{) 646} \\ \underline{549} \end{array}$$

$$\begin{array}{r} 1863 \overline{) 5773} \\ \underline{5587} \end{array}$$

$$\begin{array}{r} 186608 \overline{) 1849525} \\ \underline{14928640} \end{array}$$

1st What is the square root of

$$\begin{array}{r} 3726 \\ 49 \end{array}$$

$$\begin{array}{r} 3726 \\ 49 \end{array}$$

$$\begin{array}{r} 339 \\ 151 \end{array}$$

$$\begin{array}{r} 1849 \\ 49 \end{array}$$

$$\begin{array}{r} 1849 = 43 \\ 49 = 7 \overline{) 43} \end{array} \begin{array}{r} 6 \\ 1 \end{array} \text{Ans}$$

2nd What is the square root of

$$\begin{array}{r} 2726 \\ 16 \end{array}$$

$$\begin{array}{r} 2726 \\ 16 \end{array}$$

$$\begin{array}{r} 171 \\ 27 \end{array}$$

$$\begin{array}{r} 441 = 21 \\ 16 = 4 \overline{) 21} \end{array}$$

$$\begin{array}{r} 21 \\ 26 \end{array} \begin{array}{r} 5 \\ 1 \end{array} \text{Ans}$$

3rd What is the square root of

$$\begin{array}{r} 5721 \\ 25 \end{array}$$

$$\begin{array}{r} 5721 \\ 25 \end{array}$$

$$\begin{array}{r} 276 \\ 102 \end{array}$$

$$\begin{array}{r} 1296 = 36 \\ 25 = 5 \overline{) 36} \end{array}$$

$$\begin{array}{r} 36 \\ 81 \end{array} \begin{array}{r} 7 \\ 5 \end{array} \text{Ans}$$

4th What is the square root of

$$\begin{array}{r} 943 \\ 49 \end{array}$$

$$\begin{array}{r} 943 \\ 49 \end{array}$$

$$\begin{array}{r} 484 = 22 \\ 49 = 7 \overline{) 22} \end{array}$$

$$\begin{array}{r} 22 \\ 21 \end{array}$$

$$\begin{array}{r} 22 \\ 21 \end{array} \begin{array}{r} 3 \\ 1 \end{array} \text{Ans}$$

When this name you see,
Remember me,
And Keep mine in your
Memory.

John C. Godwin

Nov 26th 1839

Square Root By W. H. M.

5 ^{What is the square root of}

$$\begin{array}{r} 11 \overline{) 121} \\ 11 \\ \hline 0 \\ 11 \overline{) 121} \\ 11 \\ \hline 0 \end{array}$$

6 ^{What is the square root of}

$$\begin{array}{r} 11 \overline{) 121} \\ 11 \\ \hline 0 \\ 11 \overline{) 121} \\ 11 \\ \hline 0 \end{array}$$

7 ^{What is the square root of}

$$\begin{array}{r} 11 \overline{) 121} \\ 11 \\ \hline 0 \\ 11 \overline{) 121} \\ 11 \\ \hline 0 \end{array}$$

1 ^{Rule} ^{What the wall of a fortress ed B C the line ed C is 45 feet}
is 30 ft high and the ditch
before it is 27 feet wide it is
required to find the length of
a ladder that will reach to
to the opposite side of the ditch

$$\begin{array}{r} 27 \\ 27 \\ \hline 189 \\ 54 \\ \hline 729 \end{array}$$

2 ^{The top of a castle from the ground}
is 45 feet high and is surrounded
with a ditch 60 yds broad what
length must a cable be to reach
from the outside of the ditch to
the top of the castle

$$\begin{array}{r} 60 \\ 60 \\ \hline 3600 \end{array}$$

3 In a right angle triangle
A B C the hypotenous line
AC is 45 feet the Base A B
27 feet required the length of
the perpendicular line B C?

$$\begin{array}{r} 27 \\ 27 \\ \hline 189 \\ 54 \\ \hline 729 \end{array}$$

4 In the right angled triangle
A B C the line ed C is 45 feet
B C 45 feet required the length
of the line ed B

$$\begin{array}{r} 45 \\ 45 \\ \hline 2025 \end{array}$$

Square Root By W. H. Mc Rule Rule

1 If the content of a given circle be 160 What is the side of a square equal

$$\begin{array}{r} 160 \quad (12649114 \\ 22 \overline{) 60} \\ 44 \\ \hline 246 \overline{) 1600} \\ 1416 \\ \hline 2464 \overline{) 12400} \\ 10856 \\ \hline 2489 \overline{) 254400} \\ 222201 \\ \hline 2469811 \overline{) 3219900} \\ 2269811 \\ \hline 24678121 \overline{) 95008900} \\ 24678121 \end{array}$$

1 There is a circle whose diameter is 4 ft what is the diameter of one 4 times as large

$$\begin{array}{r} 4 \\ 4 \\ \hline 16 \\ 4 \\ \hline 64 \end{array}$$

2 I have a circular yard 100 feet diam but wish to enlarge to one of 3 tat area what will the diameter of the enlarged one measure 100

$$\begin{array}{r} 100 \\ 100 \\ \hline 10000 \end{array}$$

2 If the area of a circle be 2025 what is the side of the square equal

$$\begin{array}{r} 2025 \quad (45 \\ 16 \\ \hline 85 \overline{) 425} \\ 425 \end{array}$$

$$\begin{array}{r} 29 \overline{) 200} \\ 189 \\ \hline 343 \overline{) 1100} \\ 1029 \\ \hline 3462 \overline{) 9100} \\ 6924 \end{array}$$

3 If the area of a circle be 750 what is the side of the square equal

$$\begin{array}{r} 750 \quad (2738612 \\ 11 \\ \hline 47 \overline{) 350} \\ 297 \\ \hline 545 \overline{) 2100} \\ 1629 \\ \hline 5468 \overline{) 47100} \\ 43744 \\ \hline 54766 \overline{) 335600} \\ 328596 \\ \hline 547721 \overline{) 700400} \\ 547721 \\ \hline 547222 \overline{) 15269900} \\ 15269900 \end{array}$$

3 If the diameter of a circle be 12 inches what will be the diameter of another circle half the size

$$\begin{array}{r} 12 \\ 12 \\ \hline 2 \overline{) 144} \\ 12 \\ \hline 22 \overline{) 848} \\ 64 \\ \hline 164 \overline{) 800} \\ 656 \\ \hline 1688 \overline{) 1412100} \\ 1412100 \end{array}$$

Square Root By W^m H M

Rule

1 When the area is 160 what is the diameter

$$\begin{array}{r}
 160 \overline{) 126491} \\
 22 \overline{) 66} \\
 \underline{44} \\
 246 \overline{) 1600} \\
 \underline{1476} \\
 2524 \overline{) 12400} \\
 \underline{10096} \\
 25289 \overline{) 230400} \\
 \underline{227601} \\
 252981 \overline{) 279900} \\
 \underline{252981}
 \end{array}$$

$$\begin{array}{r}
 126491 \\
 112837 \\
 \hline
 885437 \\
 379473 \\
 1011928 \\
 252982 \\
 126491 \\
 126491 \\
 \hline
 14272864967 \text{ Ans}
 \end{array}$$

2 What length of a halter will be sufficient to fasten a horse that from a post in the centre so that he may be able to graze upon an acre of grass and no more

$$\begin{array}{r}
 160 \overline{) 126491} \\
 22 \overline{) 66} \\
 \underline{44} \\
 246 \overline{) 1600} \\
 \underline{1476} \\
 2524 \overline{) 12400} \\
 \underline{10096} \\
 25289 \overline{) 230400} \\
 \underline{227601} \\
 252981 \overline{) 279900} \\
 \underline{252981} \\
 126491 \\
 112837 \\
 \hline
 885437 \\
 379473 \\
 1011928 \\
 126491 \\
 126491 \\
 \hline
 142728 \\
 71364 \\
 \hline
 174606 \\
 12 \\
 \hline
 82
 \end{array}$$

Application

1 If an army of 20736 men is formed into a square column how many men will front

$$\begin{array}{r}
 20736 \overline{) 1440000} \\
 20736 \overline{) 1440000} \\
 \hline
 1440000
 \end{array}$$

$$\begin{array}{r}
 22 \overline{) 107} \\
 \underline{44} \\
 284 \overline{) 1136} \\
 \underline{1136}
 \end{array}$$

2 How many feet of board will it require to lay the floor of a room that is 25 feet square

$$\begin{array}{r}
 25 \\
 25 \\
 \hline
 125 \\
 50 \\
 \hline
 625 \text{ Ans}
 \end{array}$$

3 A certain square pavement contains 197136 square stones all of the same size how many are contained in one of its sides

$$\begin{array}{r}
 197136 \overline{) 4444} \\
 84 \overline{) 371} \\
 \underline{336} \\
 884 \overline{) 3536} \\
 \underline{3536}
 \end{array}$$

Square Root By W^m M^c Corm

4 In a triangular piece of ground containing 600 perches one of the shortest sides measure 40 perches and the other 30 what is the length of the longest

$$\begin{array}{r} \text{side} \quad 40 \quad 30 \\ 160 \quad 90 \\ \hline 1600 \quad 900 \\ 2500 \end{array}$$

What is the square root of 1030892198 / 320751 Ans

$$\begin{array}{r} 62 \overline{) 130} \\ \underline{124} \\ 60 \\ 62 \overline{) 689} \\ \underline{641} \\ 48 \\ 642 \overline{) 482198} \\ \underline{447848} \\ 343500 \\ 642141 \overline{) 3274940} \\ \underline{2210725} \\ 6421501 \overline{) 6421501} \\ \underline{6421501} \end{array}$$

William Hampton
M^c Cormicks Copy Book

5 Two gentlemen set out from pittsburgh at the same time one of them travel 84 m due north and the other 56 m due west what distance are

$$\begin{array}{r} \text{they assunder} \quad 56 \\ 84 \quad 56 \\ \hline 84 \quad 56 \\ 356 \\ 672 \\ 9656 \\ 2500 \\ \hline 9556 \end{array}$$

6 What is the square root of 9645192360241 / 3105671 Ans

$$\begin{array}{r} 61 \overline{) 64} \\ \underline{61} \\ 35792 \\ 6205 \overline{) 31025} \\ \underline{31025} \\ 22106 \overline{) 416736} \\ \underline{372636} \\ 621127 \overline{) 4410002} \\ \underline{4347887} \\ 6211941 \overline{) 6211841} \\ \underline{6211371} \end{array}$$

$$\begin{array}{r} 77625 \\ 627 \overline{) 301972} \\ \underline{388275} \\ 1136975011 \\ 113697596 \end{array}$$

Cube Root By W. H. M.

Example

1st What is the cube root of 19683

$$\begin{array}{r} 48228544 \\ 27 \end{array} \quad \begin{array}{r} 364 \text{ Ans} \end{array}$$

$$\begin{array}{r} 21228 \\ 19656 \end{array}$$

$$\begin{array}{r} 1572544 \\ 1572544 \end{array}$$

2nd What is the cube root of 13824

$$\begin{array}{r} 2 \times 2 \times 3 = 1216 \\ 2 \times 4 \times 30 = 240 \\ 1456 \end{array} \quad \begin{array}{r} 13824 \\ 5824 \\ 5824 \end{array} \quad \begin{array}{r} 24 \end{array}$$

3rd What is the cube root of 373248

$$\begin{array}{r} 7+7+3=14704 \\ 7+2=96=420 \\ 15124 \end{array} \quad \begin{array}{r} 373248 \\ 343 \\ 30248 \\ 36248 \end{array} \quad \begin{array}{r} 720 \text{ Ans} \end{array}$$

4th What is the square cube root of 5735339

$$\begin{array}{r} 1+1+3=349 \\ 7 \times 8 \times 30 = 2100 \\ 559 \end{array} \quad \begin{array}{r} 5735339 \\ 4735 \\ 3973 \end{array} \quad \begin{array}{r} 179 \text{ Ans} \end{array}$$

$$\begin{array}{r} 17+17+86781 \\ 17+9=570 \\ 91371 \end{array} \quad \begin{array}{r} 823337 \\ 823337 \end{array}$$

$$\begin{array}{r} 399473 \\ 1611928 \\ 126491 \\ 126491 \\ 2142728 \\ 71364 \\ 162 \\ 177606 \\ 12 \\ 82 \end{array} \quad \text{Ans}$$

5th What is the cube root of 846045171439

$$\begin{array}{r} 4579 \\ 11+11+3=4808 \\ 11+3=30360 \\ 5769 \end{array} \quad \begin{array}{r} 846045171439 \text{ Ans} \\ 64 \\ 20664 \\ 15507 \\ 5877517 \\ 5074517 \end{array}$$

6th What is the cube root of 27654036008

$$\begin{array}{r} 300+300+3=27000004 \\ 300 \times 30 \times 230 = 18000 \\ 27018004 \end{array} \quad \begin{array}{r} 27654036008 \\ 3002 \\ 054036008 \\ 054036008 \end{array} \quad \begin{array}{r} 27654036008 \text{ Ans} \end{array}$$

7th What is the square root of 122615327232

$$\begin{array}{r} 11+11+3=4881 \\ 4+9+30=1080 \\ 49+49+3=720336 \\ 49+6+30=8820 \\ 729136 \end{array} \quad \begin{array}{r} 122615327232 \\ 64 \\ 58615 \\ 3649 \\ 4866327 \\ 4874736 \end{array} \quad \begin{array}{r} 1101391232 \\ 591391232 \end{array}$$

By Anne (R)

Cube Root By W. H. M.

9997

8th What is the Cube Root of 22069810125

$$2 + 2 + 3 = 1264 \quad 22069810125 / 2805 \text{ Ans}$$

$$2 + 8 = 30 = 480$$

$$1744 \overline{) 14069}$$

$$1375 \overline{) 2}$$

$$280 + 280 + 3 = 2352025 \quad 117810125$$

$$280 + 5 + 30 = 42000 \quad 117810125$$

$$2374025$$

9th What is the Cube Root of 219365327791

$$60 + 60 + 3 = 108000 \quad 219365327791 / 6031 \text{ Ans}$$

$$60 + 3 + 30 = 1085409$$

$$1085409 \overline{) 3365327}$$

$$325 \overline{) 6227}$$

$$109082701 \quad 109100791$$

$$18690 \quad 109100791$$

$$109100791$$

10th What is the Cube Root of 673373097125 Answer

$$8 + 8 + 3 = 19248 \quad 673373097125 / 6031 \text{ Ans}$$

$$8 + 7 + 30 = 1686$$

$$20929$$

$$16820929 \overline{) 161373}$$

$$146503$$

$$1686396 \overline{) 14870097}$$

$$10118373$$

$$230344225 \overline{) 4751721125}$$

$$4751721125$$

$$876 \times 876 + 3 = 230212825$$

$$876 + 3 = 30 = 181400$$

$$230344225$$

11th What is the Cube root of 12977875 - 12135 Ans

$$2 + 2 + 3 = 1269$$

$$2 + 3 + 30 = 180$$

$$1389$$

$$23 + 23 + 3 = 158725$$

$$23 + 5 + 30 = 3450$$

$$1389 \overline{) 14977}$$

$$4167$$

$$162175 \overline{) 810875}$$

$$810875$$

12th What is the Cube root of 159269725041 - 2516 + Ans

$$2 + 2 + 3 = 1225$$

$$2 + 5 + 30 = 350$$

$$1525$$

$$25725 + 3 = 187525$$

$$251 + 6 = 18800336$$

$$251 + 6 = 45180$$

$$18845516$$

$$1525 \overline{) 7926}$$

$$7625$$

$$188275 \overline{) 301972}$$

$$188275$$

$$1136975011$$

$$113697546$$

Cube Root By W H Mc

Q¹ What is the cube root of $\frac{4}{7}4$

$$\begin{array}{r} 8+8+3=19204 \\ 8+2+30=480 \end{array}$$

$$\begin{array}{r} 19684 \\ 8+8+3=2066781 \\ 8+9+30=22410 \\ \hline 2089191 \end{array}$$

$$\begin{array}{r} 19684 \overline{) 571428571829} \\ \underline{512} \\ 19684 \overline{) 59428} \\ \underline{39368} \\ 2089191 \overline{) 20060576} \\ \underline{1872271} \end{array}$$

Q² What is the cube root of $\frac{3}{2}$

$$\begin{array}{r} 8+8+3=19249 \\ 8+7+30=1680 \\ \hline 20929 \end{array}$$

$$\begin{array}{r} 6666666666 \overline{) 873} \\ \underline{512} \\ 20929 \overline{) 154666} \\ \underline{146509} \\ 2191239 \overline{) 8163666} \\ \underline{6173717} \end{array}$$

Q³ What is the cube root of $\frac{5}{7}5$

$$\begin{array}{r} 8+8+3=19204 \\ 8+3+30=486 \\ \hline 19684 \end{array}$$

$$\begin{array}{r} 82+82+3=2017204 \\ 82+2+30=4920 \\ \hline 2022124 \end{array}$$

$$\begin{array}{r} 5555555555 \overline{) 82206} \\ \underline{512} \\ 19684 \overline{) 43555} \\ \underline{38368} \\ 2022124 \overline{) 5787555} \\ \underline{4044248} \end{array}$$

Rule What is the cube root of $31\frac{13}{343}$

$$\begin{array}{r} 31 \frac{13}{343} \\ \underline{31} \\ 108 \\ \underline{124} \\ 93 \\ 108 \overline{) 108} = 22 \\ \underline{343} \end{array}$$

Q⁴ What is the cube root of $12\frac{17}{27}$

$$\begin{array}{r} 12 \frac{17}{27} \\ \underline{108} \\ 24 \\ 343 \overline{) 24} = 4 \\ \underline{24} = 3 \overline{) 9} = 2 \frac{3}{3} \text{ Ans} \end{array}$$

Q⁵ What is the cube root of $465\frac{28}{125}$

$$\begin{array}{r} 465 \frac{28}{125} \\ \underline{125} \\ 2633 \\ \underline{810} \\ 405 \\ 56633 \overline{) 37} \\ \underline{125} = 5 \overline{) 37} = 7 \frac{2}{5} \text{ Answer} \end{array}$$

W H M

Cube Root By W. H. M.

Surds

What is the Cube Root of 75

$$\begin{array}{r} 1+1+3=381 \\ 1+9+30=180 \\ 1+9+30=561 \\ 19+19+3=98309 \\ 19+3+30=10009 \end{array}$$

$$\begin{array}{r} 75 \overline{) 561000000} \quad \text{Ans} \\ 75 \overline{) 561000000} \\ 75 \overline{) 561000000} \\ 75 \overline{) 561000000} \\ 75 \overline{) 561000000} \end{array}$$

5 What is the Cube Root of 85

$$\begin{array}{r} 20 \times 20 \times 3 = 120020 \\ 20 \times 5 \times 30 = 120205 \\ 205 + 205 + 3 = 12604549 \\ 205 + 7 + 30 = 12650599 \end{array}$$

6 What is the Cube Root of 96

$$\begin{array}{r} 20 \times 20 + 3 = 120081 \\ 20 + 9 + 30 = 5402 \\ 125481 \\ 209 + 209 + 3 = 13124904 \\ 209 + 2 + 30 = 13136844 \\ 13136844 \end{array}$$

RULE If the solid content of a globe is 10648 What is the side of a cube of equal solidity

$$\begin{array}{r} 2 \times 2 \times 3 = 1204 \\ 2 \times 2 \times 30 = 120 \\ 1324 \overline{) 10648} \\ 1324 \overline{) 10648} \\ 1324 \overline{) 10648} \end{array}$$

EXAMPLES There is a cubical vessel whose sides is two feet & demand the size of another vessel whose that shall contain three times that as much

$$\begin{array}{r} 2 \times 2 + 3 = 1201 \\ 2 + 4 + 30 = 60 \\ 1261 \\ 21 + 21 + 3 = 132304 \\ 21 + 2 + 30 = 1260 \\ 133564 \\ 212 + 212 + 3 = 13483216 \\ 212 + 4 + 30 = 25440 \\ 13568656 \end{array}$$

Cube Root By W H

2 There is a cubical vessel whose side is 1 foot required the side of another vessel that shall contain three times as much,

$$\begin{array}{r} 1+1+3=316 \\ 1+4+30=120 \\ \hline 436 \end{array}$$

$$\begin{array}{r} 14+14+3=58816 \\ 14+4+30=1680 \\ \hline 60496 \end{array}$$

$$\begin{array}{r} 31442 \\ 17564 \text{ Ans} \end{array}$$

$$\begin{array}{r} 3 \\ 3000 \end{array} \quad \begin{array}{r} 11442 \\ \hline \text{Ans} \end{array}$$

$$\begin{array}{r} 436 \\ 2500 \\ \hline 1744 \end{array}$$

$$\begin{array}{r} 60496 \\ 25600 \\ \hline 241984 \end{array}$$

$$\begin{array}{r} 6229444 \\ 114016000 \\ \hline 12458888 \end{array}$$

$$\begin{array}{r} 144+144+3=6220804 \\ 144+2+30=8640 \\ \hline 6229444 \end{array}$$

Application 88

1st If a ball of 6 inches diameter weigh 32 lb what will one of the same metal weigh whose diameter is 13 inches

$$\begin{array}{r} 6 : 32 :: 3 \\ 6 : 27 :: 3 \\ \hline 216 \end{array}$$

2nd What is the side of a cubical mound equal to of 288 feet long 216 broad and 48 high

$$\begin{array}{r} 288 \\ 216 \\ \hline 1728 \\ 288 \\ \hline 576 \end{array}$$

$$\begin{array}{r} 1+1+3=316 \\ 1+4+30=120 \\ \hline 436 \end{array}$$

$$\begin{array}{r} 14+14+3=58816 \\ 14+4+30=1680 \\ \hline 60496 \end{array}$$

$$\begin{array}{r} 62208 \\ 48 \\ \hline 497664 \\ 248832 \\ \hline 2985984 \end{array}$$

$$\begin{array}{r} 436 \\ 1985 \\ \hline 1744 \\ 60496 \\ 241984 \\ \hline 241984 \end{array}$$

3 There is a stone of a cubick form which contains 389017 solid feet. What is the superficial content of one of its sides

$$\begin{array}{r} 7+7+3=14709 \\ 7+3+30=630 \\ \hline 15339 \end{array}$$

$$\begin{array}{r} 389017 \\ 343 \\ \hline 15339 \\ 46014 \\ \hline 46014 \end{array}$$

$$\begin{array}{r} 178 \\ 73 \\ \hline 229 \\ 511 \\ \hline 5329 \text{ Answer} \end{array}$$

William H McCormick

Cube Root By W. H. A.

4 What is the difference between half a solid foot and solid half foot Answer 3 half feet

$$\begin{array}{r}
 12 \\
 12 \\
 \hline
 144 \\
 12 \\
 \hline
 2 \overline{) 1728} \\
 \underline{864} \\
 864 \\
 \underline{216} \\
 648 \\
 \underline{648} \\
 0
 \end{array}$$

3 Ans

$$\begin{array}{r}
 6 \\
 6 \\
 \hline
 36 \\
 8 \\
 \hline
 216
 \end{array}$$

5 In a cubical foot how many cubes of 6 inches and how many of 4 are contained therein

$$\begin{array}{r}
 6 \\
 6 \\
 \hline
 36 \\
 6 \\
 \hline
 216
 \end{array}
 \quad
 \begin{array}{r}
 216 \overline{) 1728} \\
 \underline{1728} \\
 0
 \end{array}
 \quad
 \begin{array}{r}
 4 \\
 4 \\
 \hline
 16 \\
 4 \\
 \hline
 64
 \end{array}
 \quad
 \begin{array}{r}
 4 \overline{) 1728} \\
 \underline{128} \\
 448 \\
 \underline{448} \\
 0
 \end{array}$$

Prognosis By W. H.

A merchant bought 50 yards of linen at 2 cts for the first yard 4 for the second 6 for the third & increasing two cts every yard what was the price of the last yard how much the whole amount and what the average price per yard cts

Operation
56 number of turns

Multiply $\frac{49}{2}$ number of persons less on common difference

$9\frac{1}{2}$ first term
 $10\frac{1}{2}$ last term

104 last term

Multiply by $\frac{102 \text{ sum}}{50 \text{ number of terms}}$
 $\frac{15100}{1}$

$$50 \overline{) 2550}$$

57 cts the last year
 100 cts the whole amount
 37 cts the average price per sq.

2550 the whole amount

37 the avege price per sq

2 Bought 20 yds of calico at 3 cts for the first yd
6 for the second 9 for the third Q. What did the whole
cost 20 Ans 68 cts

$$\begin{array}{r} 29 \\ \times 183 \\ \hline 87 \\ 180 \\ 522 \\ \hline 5307 \end{array}$$

3 If 100 apples were laid two yards distant from each other in a right line and a basket placed two yards distant from the first apple what distance must a person travel to gather them singly into the basket

$$\begin{array}{r} 100 \\ 2 \overline{) 100} \\ \underline{98} \end{array}$$
 Ans 4 mi 3 fur 180 yds

[illegible]

B Proportion By 2

4 A agreed to serve B 10 years at the rate of 20 for the first year 30 for the second 40 for the third &c. What had he the last year how much for the whole time and what per annum

Ans 1108 for the last year

650 the whole and 65 per annum

James B

$$\begin{array}{r} 10 \\ 9 \\ 8 \\ 7 \\ 6 \\ 5 \\ 4 \\ 3 \\ 2 \\ 1 \end{array}$$

amount for the first year

Whole Answer
65 per annum

5 A sold to B 1000 Acres of land at 10 cts for the first acre 20 for the second 30 for the third &c. what was the price of the last acre and what did the whole come to

Ans 1000 the last acre
500000 the whole cost

$$\begin{array}{r} 1000 \\ 999 \\ 998 \\ 997 \\ 996 \\ 995 \\ 994 \\ 993 \\ 992 \\ 991 \\ 990 \\ 989 \\ 988 \\ 987 \\ 986 \\ 985 \\ 984 \\ 983 \\ 982 \\ 981 \\ 980 \end{array}$$

last acre

whole cost

Progression By W H M

Rule 1 A is to receive from B a certain sum to be paid in 11 several payments in Arithmetical progression the first payment to be 20 \$ and the last to be 100 \$ What is the common difference what was each payment and how much the whole debt

Operation

100 last term

20 first term

No. of terms $11 + 1 = 10$ $\overline{) 80}$ the difference

8 common difference

$20 + 100 + 5 \times 8 = 660$ whole debt

20 first payment

$20 + 8 = 28$ second do

$28 + 8 = 36$ third do &c.

3 A man is to travel from pittsburgh to a certain place in 12 days and to go but 3 miles the first day increasing each days journey in arithmetical progression making the last days travelling 8 miles what is the daily increase and what the whole amount

amount 5 $\frac{8}{3}$

Ans { 5 miles daily increase
366 mi whole distance

$12 + 1 + 11$ $\overline{) 58}$
5 days

58
 $\overline{) 3}$
61
 $\overline{) 12}$
2582
366000

Geometrical Progression

A father gave his daughter who was married on the first day of january one \$ towards her proportion promising to Double it on the first of every month for one year what is the amount of her whole portion

1 2 3 4 5

2 4 8 16 32

32

64

96

1024

2048

4096

4695

Ans 4695 \$

Saml Geometrical Progression

3rd merchant sold 15 yards of satin the first yard for the first yard for 1st the second for 2 the third for 4 & in geometrical progression What was the price of the 15 yds abt 1638 lb 8 s 7 d

$$\begin{array}{r}
 1 \quad 2 \quad 3 \quad 4 \quad 5 \quad 6 \\
 2 \quad 4 \quad 8 \quad 16 \quad 32 \quad 64 \\
 \hline
 256 \\
 384 \\
 \hline
 14096 \\
 14 \\
 \hline
 16384 \\
 2 \\
 \hline
 32768 \\
 20 \overline{) 32768} \\
 \underline{16384} \quad 10 \text{ shrs}
 \end{array}$$

4th goldsmith 1 lb of gold at 1st for the first ounce 4 for the second 16 for the third & What did it come to and what did he gain supposing he gave 20 s per ounce And he sold it for 5592 lb 8 s 5 d and gained 5568 lb 8 s 5 d

$$\begin{array}{r}
 1 \quad 2 \quad 3 \quad 4 \quad 5 \\
 4 \quad 16 \quad 64 \quad 256 \quad 1024 \\
 \hline
 1024 \\
 4096 \\
 2048 \\
 \hline
 1024 \\
 1648576 \\
 4 \\
 \hline
 4194304 \\
 4 \\
 \hline
 16777216 \\
 4 + 1 - 8 \overline{) 16777215} \\
 \underline{5592405} \\
 240 \\
 \hline
 5568405 \\
 10240 + 120 \\
 \hline
 11240 \\
 240
 \end{array}$$

Wm H M Cormicks Copy Book Geometrical Progression

5 What sum will purchase a horse with 4 shoes and 8 nails in each shoe at 1 mill for the first nail 2 mills for the second 4 mills for the third & Doubling in geometrical progression to the last

Ans 4294967 \$29 cts 5 mi

1 2 3 4 5 6 7 8
2 4 8 16 32 64 128 256
256
1536
1280
512
65536 = 16 power
256

393 216
3 27680
131042
16777216 = 24 power
128

134217728
33554432
16777216
2147483648, first term

2147483648
2 Ratee

4294967296, first term
4294967296

6 What sum would purchase the same horse with the same number of shoes and nails at 1 mill for the first nail 3 for the second 9 for the third & in a triple ratio of geometrical progression to the last

Answer 9265100944250892 cts

1 2 3 4 5 6 7 8
3 9 27 81 343 729 2187 6561
6561
39366
32805
39366
43646721
6561

43146721
258280326
215233605
258280326
28242953648
2187
1977006455367
2259436291848
28242953648
564859042962
617673396283947
1853020188851841
21853020188851840
92651009442592
Ans

Arithmetical Progression

7 What sum would purchase the same horse with the same number of shoes and nails at 1 mill for the first nail 4 for the second 16 for the third &c. in a triple ratio of geometrical progression to the last ~~and~~ 20000

Ans 614891469123654782 etc

1 2 3 4 5 6 7 8
4 16 64 256 1024 4096 16384 65536

65536
393216
196608
327680
327680
393216
4294967296 = 16th power
4096

25767803776
38654705664
141798691840
1759218604416
1024

70368944177664
35184372088832
17592186044160
18016398509481984
256

1080866391056891904
90071992549409920
360284940018963968
4611686018427387904
16

18446744073709551616
16

4-1-3 18446744073709551615
6148914691236547820

Answer

Arithmetical Progression

Sold 30 yds of silk velvet at 2 pms for the first yard 6 for the second 18 for the third &c and these disposed of at 100 for a farthing. What did the velvet amount to; and what was gained by the sale supposing the prime cost to have been 100 lb per yd

1 2 3 4 5 6 7 8
3 9 27 81 243 729 2187

2187
85309
17496
2187

4874
4782969
4782969

43046721
28697814
43046721
9565938
38268752
33480783
19131876

22876792454961

686 30377364883

137260754729766

411782264189298

828564528346596

411782264189296

41205891132094648

121514727830232

204128939859553

214469929532d

3000

214469929532d Ans

Position By Wm H Moore

Rule 3 A B and C buy a carriage for 340 \$ of which
A pays three times as much as B and B four times as
much as C what did each pay? Ans

$$\begin{array}{r} 3/144 \\ 4 \overline{) 144} \\ 12 \\ \hline 204 \end{array}$$

$$\begin{array}{r} 340 \text{ paid } 240 \\ B \text{ paid } 80 \\ C \text{ paid } 20 \end{array}$$

$$\begin{array}{r} 340 \\ 5760 \\ 4320 \\ \hline 204 \overline{) 48960} \\ 408 \\ \hline 816 \\ 816 \\ \hline 0 \end{array}$$

$$\begin{array}{r} 3/240 \\ 4 \overline{) 80} \\ 20 \\ \hline 340 \text{ proof} \end{array}$$

4 What is the sum of which $\frac{1}{4}$ and $\frac{1}{6}$ make 148 \$
Ans 240 \$ 240

$$\begin{array}{r} \frac{1}{4} / 60 \\ \frac{1}{6} / 12 \\ \hline 37 \overline{) 14860} \\ 60 \\ \hline 880 \\ 840 \\ \hline 148 \\ 148 \\ \hline 0 \end{array}$$

5 A person having spent $\frac{1}{4}$ and $\frac{1}{3}$ of his money
had 263 \$ left what had he at first Ans 160 \$

$$\begin{array}{r} \frac{1}{4} / 18 \\ \frac{1}{3} / 3 \\ \hline 12 \overline{) 263} \\ 24 \\ \hline 23 \\ 24 \\ \hline 1 \\ 12 \\ \hline 0 \end{array}$$

6 A B and C ^{ages} talking of there B said
his age was once and ~~the~~ a half the age of B C said
his age was twice and one the the age of both and that sum
of there ages was 93 what was the age of each? Ans $1\frac{1}{2}$ 70

$$\begin{array}{r} \frac{1}{2} \text{ sup } 20 \\ 2 \overline{) 36} \\ 105 \\ \hline 155 \overline{) 1860} \\ 20 \\ \hline 155 \\ 310 \\ \hline 310 \\ \hline 0 \end{array}$$

$$\begin{array}{r} \frac{1}{2} / 12 \\ 6 \\ \hline 18 \\ 12 \\ \hline 30 \\ 30 \\ \hline 0 \end{array}$$

10
by
sal

Position By Wm. H. McCombe

7 Seven eighths of a certain number exceeds four fifths by 6 what is the number Ans 80, Con 1711

$$\begin{array}{r} 40 \\ 7 \\ \hline 8 \overline{) 280} \\ 56 \\ \hline 32 \\ 32 \\ \hline 0 \end{array}$$

$$\begin{array}{r} 40 \\ 4 \\ \hline 5 \overline{) 160} \\ 20 \\ \hline 32 \\ 32 \\ \hline 0 \end{array}$$

$$\begin{array}{r} 3:6:40 \\ 3 \overline{) 240} \\ 80 \text{ Con} \end{array}$$

8 A gentleman bought a chaise horse and harness for 360^s the horse came to twice the price of the harness and the chaise twice the price of the horse and harness together What did he give for each ^{horse} ^{harness} ^{chaise}

$$\begin{array}{r} \frac{1}{2} \overline{) 40} \\ 20 \\ \hline \frac{1}{2} \overline{) 20} \\ 10 \\ \hline \frac{1}{2} \overline{) 10} \\ 5 \\ \hline \frac{1}{2} \overline{) 5} \\ 2.5 \end{array}$$

$$\begin{array}{r} 60:360:40 \\ 40 \\ 60 \overline{) 1440} \\ 1200 \\ \hline 240 \\ 240 \\ \hline 0 \end{array}$$

80 harness

9 A gentleman being asked the price of his carriage answered that $\frac{3}{4}$ and $\frac{1}{2}$ of its price was 228^s what was the price of the carriage Con 240

$$\begin{array}{r} \frac{1}{4} \overline{) 60} \\ 15 \\ \hline \frac{1}{4} \overline{) 15} \\ 3.75 \\ \hline \frac{1}{4} \overline{) 3.75} \\ 0.9375 \end{array}$$

$$\begin{array}{r} 54:228:60 \\ 54 \overline{) 13680} \\ 1140 \\ \hline 2280 \\ 2280 \\ \hline 0 \end{array}$$

240 Con

10 A saves $\frac{1}{3}$ of his wages but B who has the same salary by spending twice as much as A sink 50^s a year which is annual salary Con 150 Con

$$\begin{array}{r} 3 \overline{) 24} \\ 8:50:240 \\ 8 \overline{) 1200} \\ 150 \text{ Con} \end{array}$$

$\frac{1}{2}$ B & B $\frac{1}{2}$ H $\frac{1}{2}$ H $\frac{1}{2}$ Hampshire $\frac{1}{2}$ H
Double Position
Rule

A and B have the same income A saves the $\frac{1}{2}$ of his but B by spending 50^s per annum more than A at the end of 8 years finds himself 40^s in debt What is their income and how much does each spend per annum

Sup $\frac{1}{8}$ 80 80
 $\frac{1}{8}$ 10 8
 70 640
 30
 108
 800
 40
 760
 640
 120 + 10 to make

Ans $\frac{1}{8}$ { there one is 200 $\frac{1}{8}$ per
 spends 175 de
 B spends 205 de Ans

Sup 80 120
 120
 40
 80
 160
 120
 1920
 320
 80 | 16000
 200 Income

Suppose 160
 $\frac{1}{8}$ 160
 20 1280
 140
 30
 170
 8
 1360
 40
 1320
 1280
 40 + 8

$\frac{1}{8}$ 200
 25 Ans
 175
 30
 205 B spends Ans

3 A B and C would divide 100 $\frac{1}{8}$ between them so as B may have 3 $\frac{1}{8}$ more than A and C $\frac{1}{8}$ more than B how many $\frac{1}{8}$ must each have

Sup $\frac{2}{3}$ 20
 $\frac{2}{3}$ 20
 23 B
 24 C
 26
 23
 24
 90
 100
 70
 30

Sup 20 30
 30
 30
 60
 60 | 1200
 20 C
 23 B
 24 C
 27 C
 100 proof

Wm H McCormick
 $\frac{2}{3}$ 20 20 40 40
 $\frac{2}{3}$ 20 23 43 43
 $\frac{2}{3}$ 20 24 44 44
 26 70 130 130
 100 100
 30 30
 20 + 30 = 60
 40 + 30 = 70
 60 + 30 = 90
 30 C
 33 B
 37 C

2
Ha

Double Position

4 A B and C built a house which cost 10000 \$
A paid a certain sum B 1000 \$ more than A and
C paid as much as both A and B how much did each
one pay

Suppose
1000 \$
1000
2000 \$
1000
3000 \$
2000
1000
6000
10000
4000 \$

Ans { 2000 \$
3000 \$
5000 \$
Sup 1000 4000
4000
4000
8000
3000 4000
4000 1000
12000000 4000000
4000
8000 1600000
A paid 2000
1000
3000 \$
2000
5000 \$
3000 \$
2000 \$
10000 proof proof proof

5 A gentleman has 2 horses and a saddle worth 50 \$ which
saddle if he put it on the back of the first horse will make
his value double that of the second ~~horse~~ but if he put it
on the second horse it will make his value triple that of the
first what is the value of each horse (Ans) { first horse 30 dollars
second horse 40

Suppose
10
30
20
30
50
80
30
50
Sup 10 50
40 25
50 10
2000 250
250
2250 30 first horse
225 50
02 80
40 2 horse
Sup 40 40
50 120
2 90 95
45 25
50 25
95

Wm H. McCormick

Double Position By 7th

6 The head of a fish is 7 inches long and its tail is as long as its head and half its body and its body is as long as its head and tail together What is its whole length A 6 feet

$$\begin{array}{r} \text{Sup} \\ 1\frac{1}{2} \overline{) 30} \\ \underline{1\frac{1}{2} 15} \\ 75 \\ \underline{9} \\ 165 \\ \underline{9} \\ 255 \\ \underline{11} \\ 105+ \end{array}$$

$$\begin{array}{r} \text{Sup } 30 \quad 10\frac{1}{2}+ \\ \text{Sup } 60 \quad 3+ \\ 10\frac{1}{2} \\ \underline{6000} \\ 30 \\ \underline{630} \\ 90+2 \\ 95 \overline{) 5400} \overline{) 42} \\ \underline{525} \\ 150 \\ \underline{150} \end{array}$$

$$\begin{array}{r} 10\frac{1}{2} \\ 3 \\ \underline{7\frac{1}{2}} \end{array}$$

7 A laborer hired 40 days upon this condition that he should receive 20 cts for every day he wrought and forfeit 10 cts for every day he was idle at settlement he received 5 \$ how many days did he work and how many was he idle A he wrought 30 days

$$\begin{array}{r} 34 \\ \underline{20} \\ 680 \\ \underline{60} \\ 620 \\ \underline{5} \\ 120 \end{array}$$

$$\begin{array}{r} 40 \\ \underline{30} \\ 16 \\ \underline{16} \\ 60 \end{array}$$

$$\begin{array}{r} 24 \\ \underline{20} \\ 480 \\ \underline{160} \\ 320 \end{array}$$

idle 10

$$\begin{array}{r} \text{Sup } 34 \\ 180 \\ \underline{2720} \\ 34 \\ \underline{6120} \\ 2880 \end{array}$$

$$\begin{array}{r} 120 \\ \underline{24} \\ 480 \\ \underline{240} \\ 2880 \end{array}$$

$$\begin{array}{r} 40 \\ \underline{30} \\ 10 \\ \underline{16} \\ 100 \end{array}$$

$$\begin{array}{r} 40 \\ \underline{24} \\ 160 \end{array}$$

$$\begin{array}{r} 300 \text{ } 19000 \\ \underline{30 \text{ he wrought } 100} \\ 20 \\ \underline{600} \end{array}$$

8 C and B vested equal sums in trade A gained a sum equal to 1/3 of his stock and B lost 22 \$ then C's money was double that of B's What sum had each vested Ans 600 \$

$$\begin{array}{r} 4 \overline{) 400} \\ \underline{400} \\ 0 \end{array}$$

$$\begin{array}{r} 240 \\ \underline{225} \\ 15 \\ \underline{300} \\ 30 \\ \underline{270} \\ 150 \\ \underline{120} \end{array}$$

$$\begin{array}{r} \text{Sup } 400 \quad 150 \\ 240 \\ \underline{150} \\ 12000 \\ \underline{2400} \\ 9600 \\ \underline{1200} \\ 8400 \end{array}$$

600

Don't be Position

7 Divide into two such parts so that when the greater is multiplied by 4 and the less by 16 the product will be equal

10 A person being asked in the afternoon what o'clock it was answered that the time from noon was equal to $\frac{1}{3}$ of the time to midnight. What o'clock was it. Ans 36 minutes past 1 o'clock.

$$\begin{array}{r} 12 \\ 1 \overline{) 11} \\ \underline{11} \\ 2 \end{array}$$

$$\begin{array}{r} 19 \\ 1 \overline{) 13} \\ \underline{1} \\ 12 \end{array}$$

Sup. 1 $\frac{9}{18}$ L

Sup. 3 $\frac{21}{18}$ L

$\frac{13}{21}$

$\frac{13}{13}$

Sep 3 12
 3

$$\begin{array}{r} 9 \\ 2 \\ 13 \overline{) 18} \\ \underline{15} \\ 3 \end{array}$$

$$\begin{array}{r} 1 \overline{) 13} \\ \underline{13} \\ 0 \end{array}$$

$$\begin{array}{r} 1 \overline{) 13} \\ \underline{13} \\ 0 \end{array}$$

Mult 3 by $\frac{9}{3}$

$$\begin{array}{r} 3 + 9 = 27 \\ 1 + 13 = 13 \end{array}$$

$$\begin{array}{r} 21 \\ \hline 13 \end{array}$$

$$48 \cdot 36 = 48 \cdot 18 \cdot 2 = 1728$$

$$13 \cdot 13 = 13 + 30 + 390 + 624 + 398 \quad \checkmark$$

$$\begin{array}{r} 234 \\ 2360 \\ \hline 390 \overline{) 1140} \quad 36 \\ \underline{990} \\ 150 \end{array}$$

Permutation By W H M^o

2^d How many changes may be rung on 12 bells an how long would they be ringing but once over allowing 10 changes to be rung in one minute and the year to contain 365 days 6 hours
Ans 479001600 changes and would require 91 years 3 w 5 d 6 h

$$\begin{array}{r}
 12 \\
 \times 11 \\
 \hline
 132 \\
 1320 \\
 \hline
 11880 \\
 \times 4 \\
 \hline
 95040 \\
 \times 6 \\
 \hline
 665280 \\
 \times 3 \\
 \hline
 3991680 \\
 \times 1 \\
 \hline
 19958400 \\
 \times 4 \\
 \hline
 79833600 \\
 \times 3 \\
 \hline
 239500800 \\
 \times 2 \\
 \hline
 10 \overline{) 479001600} \\
 \underline{66} \overline{) 479001600} \\
 8766 \overline{) 798336} \quad 191 = 3 = 5 = 6 \text{ answers} \\
 \underline{48994}
 \end{array}$$

$$\begin{array}{r}
 168 \overline{) 12615} \\
 \underline{24} \overline{) 12615} \\
 \underline{120} \\
 6
 \end{array}$$

3 Seven men not agreeing with the owner of a boarding house about the price of boarding offer to give 100 £ each as long time as they can seat themselves every day differently at dinner this offer being excepted how long may they stay
Ans 5040 days

$$\begin{array}{r}
 100 \\
 \times 5040 \\
 \hline
 504000 \\
 \times 2 \\
 \hline
 1008000 \\
 \times 3 \\
 \hline
 3016000 \\
 \times 4 \\
 \hline
 12064000 \\
 \times 5 \\
 \hline
 50320000 \\
 \times 6 \\
 \hline
 301920000 \\
 \times 7 \\
 \hline
 2113440000
 \end{array}$$

Permutation By Wm H M

4 Q What number of variations will the 9 digits admit of

of 362880 ans

$$\begin{array}{r}
 1 \\
 2 \\
 3 \\
 6 \\
 24 \\
 120 \\
 720 \\
 5040 \\
 40320 \\
 362880 \text{ ans}
 \end{array}$$

162 = 5 - 10 = 630

2
2

Subtraction of Duodecimals

Examples

$$\begin{array}{r} \text{ft in } \text{m } \text{m} \\ 2456 = 5 = 4 = 8 = 0 \\ 1839 = 9 = 5 = 11 = 10 \\ \hline 916 = 8 = 1 = 8 = 2 \text{ Ans} \end{array}$$

3 From a board measuring 35 feet 9 inches 2 seconds cut 24 feet 10 inches 5 seconds and 11 thirds. What is left

Ans 10 ft 10 in 8 sec. 8 th

$$\begin{array}{r} \text{ft in } \text{m } \text{m} \\ 35 = 9 = 2 = 0 \\ 24 = 10 = 5 = 11 \\ \hline 10 = 10 = 8 = 8 \text{ Answer} \end{array}$$

4 A joiner having lined several rooms very curiously with costly materials finds the amount to be in square is front measure 803 feet 3 inches 4 seconds but several deductions being to be made for windows arches &c those deductions amounted to 630 feet 3 in 17 sec. 10 ths & how many feet of workmanship must he pay for

$$\begin{array}{r} \text{ft in } \text{m } \text{m} \\ 803 = 3 = 4 = 0 = 0 \\ 630 = 3 = 4 = 10 = 5 \\ \hline 173 = 11 = 8 = 1 = 4 \text{ Ans} \end{array}$$

how about the price of board in time as they can seat themselves at dinner this offer being

$$\begin{array}{r} 4 \\ 6 \\ \hline 42 \\ 210 \\ \hline 840 \\ 2520 \\ \hline 365 \end{array} \quad \begin{array}{r} 50 \\ 40 \\ \hline 90 \\ 365 \\ \hline 1390 \\ 1095 \\ \hline 2485 \end{array} \text{ Ans}$$

Multiplication of Duodecimals

RULE

2 Multiply ft by ft in by in m by m

$$\begin{array}{r} \text{ft in } \text{m } \text{m} \\ 6 \frac{1}{2} \times 2 \frac{1}{3} \\ \hline 9 = 5 = 3 = 11 \\ 8 = 3 \\ 4 = 8 = 6 \\ 2 = 4 = 3 \\ 1 = 6 = 10 \\ \hline 36 = 10 = 4 \text{ Ans} \end{array}$$

3 Mult 7 ft 10 in by 8 ft 11 in

$$\begin{array}{r} \text{ft in } \text{m } \text{m} \\ 6 \frac{1}{2} \times 8 \frac{1}{2} \\ \hline 17 = 10 = 7 = 11 \\ 8 = 11 \\ 36 = 2 = 8 \\ 3 = 11 \\ 2 = 7 = 4 \\ 7 = 10 \\ \hline 69 = 10 = 2 \text{ Ans} \end{array}$$

4 Mult 3 ft 4 in by 2 ft 11 in

$$\begin{array}{r} \text{ft in } \text{m } \text{m} \\ 6 \frac{1}{2} \times 2 \frac{1}{2} \\ \hline 16 = 9 = 0 \\ 4 = 2 = 3 \\ 8 = 4 = 6 \\ 2 = 7 = 6 \\ \hline 2110 = 5 = 0 \text{ Ans} \end{array}$$

5 What is the price of a marble slab whose length is 5 ft 11 inches and breadth 1 ft 10 inches at 18 50 cts per foot

$$\begin{array}{r} 50 \frac{1}{2} \times 10 \frac{1}{2} \\ \hline 10 = 2 = 10 \\ 156 \\ \hline 90 \\ 5 \\ \hline 2525 \\ 103125 \\ 1041 \\ \hline 1535416 \text{ Ans} \end{array}$$

Wm H. H.

Multiplication of Duodecimals

There is a house with three tiers of windows in a tier the height of the first tier is 4 ft 10 in of the second 6 ft 8 in and of the third 5 ft 4 in and the breadth of each window is 3 ft 11 in What will the glazing come to at 14 cts per lb

ft in	Ans 328 62 1/2 cts
17 = 10	ft in
3 = 11	6 = 8
23 = 6	3 = 11
7 = 2 = 2	20 = 0
38 = 8 = 2	6 = 2 = 4
3	26 = 2 4
92 = 0 = 6	78 = 7 = 0
	62 = 5 = 0
	92 = 0 = 6
10	23 3 = 0 = 6
4	233
6	466
	466
	045
	32,625 cts

RULE

2 Mult 17 ft 6 in by 19 ft 10 in

6	1/2	176 = 11
		6
		459 = 6
		3
		1378 = 6
		76 = 7
3	1/2	1455 = 1
		38 = 3 = 6
		19 = 1 = 9
		6 = 4 = 7
		1518 = 10 = 10 cts

3 Mult 12 ft 7 in by 9 ft 2 in

4	1/3	127 = 6
		9
		1147 = 60
		11475 = 0
		127 = 6
		127 = 6
		11430 = 0
		42 = 6
		11472 = 6 cts

4 Mult 18 ft 4 in by 12 ft 7 in

6	1/2	184 = 8
		21
		3878 = 0
		6
		23268 = 0
		184 = 8
6	1/2	23452 = 8
		92 = 4
		23545 = 0 cts

6 A floor is 40 feet 8 in by 38 feet 11 in how many square feet are therein

6	1/2	408 = 8
		6
		424 = 0
		6
3	1/2	2544 = 0
		70 = 8
		70 = 8
		2685 = 4
		85 = 4
		17 = 8
		11 = 9 = 4
		2750 = 1 = 4 cts

11 If a ceiling be 57 ft 9 inches long 24 ft 6 in broad how many yards does it contain

6	1/2	579 = 9
		6411 = 24
		358 = 6
		14
		1494 = 00
		27 = 10 = 6
9	1/2	1463 = 10 = 6
		162 = 5 = 10 = 6 cts

302

36

0900

0913

09

6

2

2

Duodecimals By Wm H

8th

What will the paving of a court yard come to at 15 cts per yd the length being 58 ft 6 in and breadth 54 ft 6 in and 8384

$$\begin{array}{r}
 6 \overline{) 58.6} \\
 \underline{9+6=54} \\
 526=6 \\
 \underline{6} \\
 3159=00 \\
 \underline{29=08} \\
 14=6 \\
 93202=6 \\
 \underline{6355} \\
 15 \\
 63355 \\
 \underline{2} \\
 166 \\
 \underline{166} \\
 53383.20 \text{ Ans}
 \end{array}$$

9th What is the solid content of a bale of goods measuring in length 4 ft 6 in breadth 3 ft 3 in depth 1 ft 10 in

$$\begin{array}{r}
 4=6 \\
 3=3 \\
 22-6 \\
 \underline{1+1=8} \\
 24=4=6 \\
 \underline{1=10} \\
 24-4=6 \\
 20=3=9=0 \\
 44=8=3 \text{ Ans}
 \end{array}$$

10th A merchant imports from London 300 bales of the following dimensions viz length breadth depth

No	length	breadth	depth
1	2=10	2=4	1=9
2	2=10	2=6	1=3
3	3=6	2=2	1=8
4	2=10	2=8	1=9
5	2=10	2=6	1=9
6	2=11	2=8	1=8

What are the solid contents and how much freight amount to at 20 s per ton of 40 feet 71 ft 4 in 35849.6

2=10 2=4	2=10 2=6	3=6 2=2
5=8 1=4	5=8 1=5=0	7=0 7=0
6=7=4 1=9	7=1=0 1=3	7=7=0 1=8
6=7=4 4=11=6=0	7=1=0 1=9=3=0	7=7=0 5=0=8=0
11=6=10=0	8=10=3=0	127=8=0

2=10 2=8	2=10 2=6	2=11 2=8
5=8 1=10=8	5=8 1=5=0	5=10 1=11=4
7=4=8 1=7	7=1=0 1=9	7=9=4 1=8
7=4=8 5=6=7=0	7=1=0 5=3=9=0	7=9=4 5=2=2=8
13=1=3=0	12=4=9=0	12=11=6=8

40	71=7=3=8
20	1=31=7
10	26
10	20
6	10
1	5
1	25
1	4

$$\begin{array}{r}
 40 \\
 20 \\
 10 \\
 10 \\
 6 \\
 1 \\
 1 \\
 1 \\
 835.79 \text{ Ans}
 \end{array}$$

Rule

3rd A single decked vessel is 64 feet long 22 feet broad 10 feet deep. What is its tonnage Ans 148 tons

$$\begin{array}{r}
 64 \\
 22 \\
 \underline{128} \\
 128 \\
 14080 \\
 95 \overline{) 14080} \quad 148 \\
 95 \\
 \underline{4580} \\
 780 \\
 760 \\
 \underline{20=4} \\
 795=19
 \end{array}$$

4th What will be the tonnage of a double deck vessel whose length is 80 ft and breadth 26 ft

$$\begin{array}{r}
 80 \\
 26 \\
 \underline{160} \\
 2080 \\
 13. \\
 6240 \\
 2080 \\
 95 \overline{) 27040} \quad 284 \frac{1}{2} \text{ Ans}
 \end{array}$$

$$\begin{array}{r}
 95 \overline{) 27040} \quad 284 \frac{1}{2} \text{ Ans} \\
 190 \\
 \underline{804} \\
 760 \\
 \underline{440} \\
 386 \\
 \underline{560=12} \\
 595=19
 \end{array}$$

Carpenter's or Sliding Rule

2 Mult 12 by 16 Ans 192 Ans

$$\begin{array}{r} 16 \\ 12 \\ \hline 192 \end{array}$$

3 Mult 35 by 19 Ans 665

$$\begin{array}{r} 35 \\ 19 \\ \hline 665 \end{array}$$

4 Mult 240 by 54 Ans 14580

$$\begin{array}{r} 240 \\ 54 \\ \hline 14580 \end{array}$$

Division of numbers by the

2 Divide 665 by 19 Ans 35

$$\begin{array}{r} 19 \overline{) 665} \\ 57 \\ \hline 95 \\ 95 \\ \hline 0 \end{array}$$

3 Divide 396 by 24 Ans 16.5

$$\begin{array}{r} 24 \overline{) 396} \\ 48 \\ \hline 126 \\ 120 \\ \hline 66 \\ 60 \\ \hline 6 \end{array}$$

4 Divide 744 by 42 Ans 17.6

$$\begin{array}{r} 42 \overline{) 744} \\ 84 \\ \hline 321 \\ 294 \\ \hline 276 \\ 252 \\ \hline 24 \end{array}$$

5 Divide 7680 by 24 Ans 320

$$\begin{array}{r} 24 \overline{) 7680} \\ 48 \\ \hline 288 \\ 240 \\ \hline 480 \\ 480 \\ \hline 0 \end{array}$$

Examples

Required the fourth proportional term to the numbers 25: 48: 100 cns 300

$$\begin{array}{r} 25: 48: 100 \\ 25 \overline{) 4800} \\ 500 \end{array}$$

3 Required the fourth proportional term to the numbers 24: 20: 7.5 Ans 6.25

$$\begin{array}{r} 24: 20: 7.5 \\ 24 \overline{) 150} \\ 100 \end{array}$$

1 Require the square root of 400 cns 20

$$\begin{array}{r} 20 \overline{) 400} \\ 400 \end{array}$$

2 Require the square Root of 529

$$\begin{array}{r} 23 \overline{) 529} \\ 46 \\ \hline 69 \\ 69 \end{array}$$

3 Require the square Root of 900

$$\begin{array}{r} 30 \overline{) 900} \\ 900 \end{array}$$

4 What is the square root of 300

$$\begin{array}{r} 17.32 \overline{) 300} \\ 289 \\ \hline 110 \\ 102 \\ \hline 8 \end{array}$$

Remainder

Meas

Measuring of Boards

Example 1 Require the superficies of a board whose mean breadth is 1 ft 2 inches and length 12 ft 6 inches in cubits or feet.

$$\begin{array}{r} 12 = 6 \\ 1 = 2 \\ \hline 12 = 6 \\ 2 = 1 = 0 \\ \hline 14 = 7 = 0 \text{ Answer} \end{array}$$

13 Required the value of 5 oaken planks at 50s per foot each of them being 17½ feet long and their several breadths as follows viz two 13½ inches in the middle 1 of 14½ inches in the middle and the two remaining ones each 18 inches at the broader end and 11½ at the narrower.

$$\begin{array}{r} 1 \quad 12 \quad 17 = 6 \\ \quad \quad 1 = 1 = 6 \\ 6 \quad 2 \quad 17 = 6 \\ \quad \quad 1 = 5 = 6 \\ \quad \quad 8 = 9 \\ \quad \quad 19 = 8 = 9 \\ \quad \quad 2 \\ \hline 39 = 4 = 6 \\ 21 = 1 = 9 \\ 42 = 9 = 10 = 6 \\ 105 = 2 = 1 = 6 \\ 03 \\ 309 \\ 005 \\ \hline 3095 \text{ shillings} \end{array}$$

$$\begin{array}{r} \text{Ans } 8 \frac{1}{2} \text{ Pence} \\ 2 \quad 6 \quad 17 = 6 \\ \quad \quad 1 = 2 = 6 \\ 6 \quad 4 \quad 17 = 6 \\ \quad \quad 2 = 11 \\ \quad \quad 8 = 9 \\ \quad \quad 21 = 1 = 9 \\ \hline 18 \frac{3}{4} \\ 11 \frac{1}{4} \\ \hline 29 \frac{1}{2} \\ 14 = 7 = 6 \end{array}$$

Rule

2 How many inches in length of a board that is 23 wide will make 1 ft

$$\begin{array}{r} 23 \overline{) 144} \quad 6 \text{ } 26 \text{ } \text{Ans} \\ 138 \\ \hline 60 \\ 46 \\ \hline 146 \\ 138 \\ \hline 8 \end{array}$$

3 From a mahogany plank 26 inches broad a yard and a half (or 13 feet 6 inches) is required to be cut off. What distance from the end must the line be struck

$$\begin{array}{r} \text{Answer } 74, 76, 72 \text{ inches or } 6, 23 \text{ feet} \\ 26 \overline{) 144} \quad 5 \text{ } 53 \text{ } 83 \\ 130 \\ \hline 140 \\ 130 \\ \hline 100 \\ 78 \\ \hline 220 \\ 208 \\ \hline 120 \end{array}$$

$$\begin{array}{r} 12 \overline{) 7476905} \text{ inches} \\ 623 \text{ ft } \text{Ans} \end{array}$$

Measuring Of Boards Rule

2 If the quarter girt of a piece of squared timber is 15 inches and length 18 ft required the solidity

$$\begin{array}{r} 15 \\ \times 18 \\ \hline 135 \end{array}$$

$$\begin{array}{r} 15 \\ \times 18 \\ \hline 225 \end{array}$$

$$\begin{array}{r} 15 \\ \times 18 \\ \hline 270 \end{array}$$

$$144 \overline{) 4050} \quad 28 \frac{1}{2} \text{ ctns}$$

$$\begin{array}{r} 1140 \\ 1032 \\ \hline 108 \end{array}$$

$$18 \overline{) 108} = 6$$

28 $\frac{1}{2}$ ft in

$$\begin{array}{r} 32 \\ 10 \\ \hline 2142 \end{array}$$

$$\begin{array}{r} 21 \\ 18 \\ \hline 63 \end{array}$$

$$\begin{array}{r} 21 \\ 18 \\ \hline 273 \end{array}$$

$$\begin{array}{r} 2184 \\ 278 \\ \hline 2406 \end{array}$$

$$144 \overline{) 4050} \quad 28 \frac{1}{2} \text{ ctns}$$

Rule

2 If the length of a tree is 24 ft its girt at the thicker end is 14 ft at the smaller end and 8 inches square at the top and the length be 20 ft What is the solid content

$$\begin{array}{r} 14 \\ 216 \\ \hline 418 \end{array}$$

$$\begin{array}{r} 24 \\ 24 \\ \hline 96 \text{ ctns} \end{array}$$

3 If a piece of squared timber be 25 inches square at the greater end and 8 inches square at the less end and the length be 20 ft What is the solid content

$$\begin{array}{r} 25 \\ 9 \\ \hline 2134 \end{array}$$

$$\begin{array}{r} 2134 \\ 14 \\ \hline 119 \end{array}$$

$$\begin{array}{r} 119 \\ 19 \\ \hline 289 \end{array}$$

$$\begin{array}{r} 289 \\ 20 \\ \hline 5780 \end{array}$$

$$144 \overline{) 5780} \quad 40 \frac{1}{2} \text{ ctns}$$

$$\begin{array}{r} 5760 \\ 200 \\ \hline 144 \end{array}$$

$$\begin{array}{r} 560 \\ 144 \\ \hline 604 \end{array}$$

3 If a piece of round timber measure 18 ft long 96 inches in circumference at the quarter girt 24 inches how many ft of timber does it contain

$$\begin{array}{r} 1212 \\ 24 \\ \hline 42 \end{array}$$

$$\begin{array}{r} 42 \\ 12 \\ \hline 72 \text{ ctns} \end{array}$$

4 Suppose a piece of squared timber to measure 32 by 20 inches at the greater end and 10 by 6 inches at the less end length 18 ft how many feet of timber are contained therein

4 If a piece of round timber measure 11 ft 4 inches at the larger end 2 ft 8 at the less and its length 21 ft how many ft of timber are contained therein

$$\begin{array}{r} 114 \\ 208 \\ \hline 2148 \end{array}$$

$$\begin{array}{r} 2148 \\ 44 \\ \hline 175 \end{array}$$

$$\begin{array}{r} 175 \\ 175 \\ \hline 875 \end{array}$$

$$\begin{array}{r} 875 \\ 1225 \\ \hline 195 \end{array}$$

$$\begin{array}{r} 195 \\ 30625 \\ \hline 21 \end{array}$$

$$64 \overline{) 3125} \quad 48 \frac{1}{2} \text{ ctns}$$

Ans

Carpenters And Joiners Work

Require the amount of three pieces of round timber measuring as follows

the first 24 ft long and mean girt 6
 the second 14 ft do do 3,15
 the third 17 ft do do 6,26
 Ans 147,54

$ \begin{array}{r} 418 \overline{) 4615} \\ 836 \\ \underline{679} \\ 1355 \\ 2710 \\ \underline{3548} \\ 1067 \\ 2134 \\ \underline{2851} \\ 717 \\ 1434 \\ \underline{1434} \\ 0 \end{array} $	$ \begin{array}{r} 4 \overline{) 628} \\ 157 \\ \underline{157} \\ 0 \end{array} $
--	---

248062500
 620156252
 31007812
 899226562
 96000
 42500
 147500 Answer

A room is 35 ft long and so wide there is in it a fire place which measures 6 ft by 4 ft 6 in and a well hole for the stairs measures 10 ft 6 inches by 8 ft What will the flooring come to at 38 and 175 cts per square

Ans 358214 cts

$ \begin{array}{r} 350 \\ 350 \\ \underline{1050} \\ 111 \\ 939 \\ 50 \overline{) 250} \\ 100 \\ \underline{150} \\ 100 \\ \underline{50} \\ 0 \end{array} $	$ \begin{array}{r} 24 = 0 \\ 10 = 6 \\ 84 = 0 \\ 24 = 0 \\ 111 \end{array} $
--	--

35,21,25 Ans

Carpenters And Joiners Work

Let a floor be 53 ft 6 inches long and 47 ft 9 inches broad how many squares does it contain at 25 squares 5 ft

53 = 6
 481 = 6
 2407 = 6
 53 = 6
 53 = 6
 2584 = 6
 26 = 9
 18 = 4
 100 12554 = 7
 Sq 25,54 ft Answer

How many squares are contained in a partition that is 82 ft 6 inches long and 12 ft 3 inches high

Ans 10 squares 10 ft

$ \begin{array}{r} 82 = 6 \\ 12 = 3 \\ 990 = 8 \\ 20 = 6 = 6 \\ 100 \overline{) 1000} \\ 100 \\ \underline{0} \end{array} $	$ \begin{array}{r} 100 \overline{) 1000} \\ 100 \\ \underline{0} \end{array} $
---	--

Squares 10 ft Ans

3) A floor being 36 feet 3 inches long and 16 feet 6 inches broad What will many squares are contained in it cost at 48 and 50 cts per square

Ans 26,91 cts

$ \begin{array}{r} 36 = 3 \\ 6 \overline{) 145} \\ 120 \\ \underline{25} \\ 580 = 0 \\ 18 = 1 = 6 \\ 50 \overline{) 598} \\ 500 \\ \underline{98} \\ 2392 \\ 299 \\ \underline{2691} \end{array} $	$ \begin{array}{r} 91 = 9 \\ 11 = 3 \\ 1009 = 3 \\ 22 = 11 = 3 \\ 50 \overline{) 1032} \\ 1000 \\ \underline{32} \\ 4128 \\ 516 \\ \underline{4644} \end{array} $
---	--

26,91 cts Ans

6) If a partition between rooms be in length 91 ft 3 inches and its length high 11 ft 3 inches how many squares are contained in it and how much does it contain come to at 48 50 cts per square

Ans 46,44 cts

$ \begin{array}{r} 91 = 9 \\ 11 = 3 \\ 1009 = 3 \\ 22 = 11 = 3 \\ 50 \overline{) 1032} \\ 1000 \\ \underline{32} \\ 4128 \\ 516 \\ \underline{4644} \end{array} $	$ \begin{array}{r} 46,44 \end{array} $
--	--

Wm Hampton

Ham

Hampton

Carpenters And Joiners Work

What cost the roofing of a house at 140 cts per square the length within the walls being 52 ft 8 inches and the breadth 31 ft 6 inches the roof being of a true pitch comes 33 73 cents

$$\begin{array}{r} 6 \overline{) 52} = 8 \\ 31 \overline{) 6} = 0 \\ 1580 = 0 \\ 26 \quad 4 = 0 \\ 1606 - 4 = 0 \\ 808 = 2 - 0 \\ 2409 = 6 = 0 \\ 24 = 9 - 6 \\ 140 \\ 5 \overline{) 140} = 28 \\ 4 \overline{) 28} = 7 \\ 6 \overline{) 7} = 1 \\ 33733 \text{ Ansverse} \end{array}$$

Suppose a house measures within the walls 50 ft 6 inches in length and 20 ft 6 inches in breadth square and supposing the height of the roof being of a true pitch room including the cornices and how many squares does it contain and how much will it cost at 25 cts per square comes 1245875 squares and cost 28821 cts

$$\begin{array}{r} 405 \\ 205 \\ 2025 \\ 810 \\ 83025 \\ 675125 \\ 25 \overline{) 1245875} = 49835 \text{ Squares} \\ 2490750 \\ 311348 \\ 2802073 \text{ Ans} \end{array}$$

If a room of wainscot be 16 ft 3 inches high and the compass of the room 13 ft 6 inches, how many yards are contained in it at 248 yds 2 ft

$$\begin{array}{r} 13 \overline{) 16} = 1 \\ 13 \overline{) 36} = 2 \\ 6875 \\ 2450 \\ 8230 \\ 1345 \\ 9 \overline{) 2254875} = 24820 \end{array}$$

If the window shutters about a room be 6 ft 9 in high broad and 6 ft 3 in high how many yards are contained therein at work and half 7265 cts

$$\begin{array}{r} 6945 \\ 625 \\ 34875 \\ 13950 \\ 41850 \\ 24359375 \\ 2179687 \\ 9 \overline{) 16589162} = 1265440 \text{ Ans} \end{array}$$

What will the wainscotting of a room come to at 80 cts per square and supposing the height of the room be 12 ft 6 inches and the compass 17 ft 6 in by 2-6 and the door 4 ft by 3-6 the shutters and door being worked on both sides are reckoned work and half 8838

$$\begin{array}{r} 1004 = 00 \\ 41 = 16 \\ 1045 = 10 \\ 11 = 00 \\ 9 \overline{) 108610} = 12067 \\ 6 \overline{) 12067} = 2011 \\ 6 \overline{) 2011} = 335 \\ 6 \overline{) 335} = 55 \\ 6 \overline{) 55} = 9 \\ 6 \overline{) 9} = 1 \\ 966075 \end{array}$$

Answers

Brick Layers Work

EXAMPLES

2

How many yards and rods of standard thickness are contained in a brick wall whose length is 54-3 and height 24-6 the wall being 2½ bricks thick

$$\begin{array}{r} 54,25 \\ 24,5 \\ \hline 28645 \\ 22900 \\ \hline 11450 \\ 1402,645 \end{array}$$

$$\begin{array}{r} 3 \overline{) 11450} \quad 13,125 \\ 9 \overline{) 259,14} \quad 28,708 \\ \hline 259,14 \text{ yds} \end{array}$$

Ans 25 yds 740 rods 858

3

If a wall be 245 ft 1 inch long 16 ft 6 inches high and 2½ bricks thick how many rods of brick work are contained therein when reduced to standard measure thickness

Ans 24 Rods 3 quarters 24 ft

$$\begin{array}{r} 245,75 \\ 16,5 \\ \hline 122,875 \\ 1494,50 \\ \hline 245,750 \\ 4054,875 \end{array}$$

$$\begin{array}{r} 3 \overline{) 20244,375} \\ 2926,758,125 \quad 24 \text{ Rods} \\ \hline 544 \\ 1318 \\ \hline 1088 \\ 68 \overline{) 230} \quad 3 \text{ quarters} \\ \hline 204 \\ \hline 26 \text{ ft} \end{array}$$

4 A triangle gable end is raised to the height of 15 ft above the wall of a house whose width is 45 ft and the thickness of the wall is 2½ brick thick require the content in rods at standard Measure Ans 2 Rods 18 ft

$$\begin{array}{r} 45 \\ 15 \\ \hline 225 \\ 45 \\ \hline 27675 \\ 3845 \\ \hline 316875 \\ 272,562,5 \quad 2 \text{ Rods} \\ \hline 544 \\ 18 \text{ ft} \end{array}$$

W. H. Marmicks

Masons Work By W H M

RULE

2 How many solid feet and perches 10 inches at 80 cts per superficial are contained in a wall $36\frac{1}{2}$ long foot Ans 88 19 cts 12 ft 3 inches high and 2 ft thick

$$\begin{array}{r}
 12.25 \\
 585 \\
 6125 \\
 8675 \\
 6125 \\
 655845 \\
 24.75 \overline{) 1810750} \quad 529595 \text{ Rods} \\
 \underline{12375} \\
 9325 \\
 4950 \\
 28950 \\
 22245 \\
 14750 \\
 12375 \\
 165 \overline{) 8225} \\
 \underline{15} \\
 8225 \\
 165 \\
 24.75
 \end{array}$$

What is a marble slab worth whose length $5\frac{1}{4}$ and breadth 1 ft

$$\begin{array}{r}
 5 = 7 = 10 \\
 2 \overline{) 15} = 7 = 10 \\
 10 \overline{) 10} = 2 = 10 \\
 80 \\
 800 \\
 16 \\
 88.19 cts \text{ Ans}
 \end{array}$$

3 If a wall be $104\frac{1}{4}$ long and $10\frac{1}{2}$ high how many superficial ft are contained therein ft Ans 2208 $10\frac{1}{2}$

$$\begin{array}{r}
 10775 \\
 205 \\
 53875 \\
 215600 \\
 1728 \overline{) 2208875} \text{ 10 ft} \\
 \underline{1728} \\
 480
 \end{array}$$

4 If a wall be $112\frac{1}{2}$ long and $16\frac{1}{2}$ high how many superficial rods each 60 ft square ft are contained therein Ans 29 Rods 25 ft

$$\begin{array}{r}
 11225 \\
 165 \\
 56125 \\
 64350 \\
 11225 \\
 63 \overline{) 185225} \quad 29 \text{ Rods} \\
 \underline{126} \\
 592 \\
 567 \\
 25
 \end{array}$$

Plasterers Work

2 If the plastered partition between rooms be 141 ft⁶ about and 11 ft 3 high how many yds do they contain Ans 176,81

$$\begin{array}{r} 1415 \\ 1125 \\ \hline 4075 \\ 2830 \\ \hline 1415 \\ 1415 \\ \hline 9)1591875 \\ 17487 \end{array}$$

3 What will the plastering of a ceiling come to at 15 cts per yd allowing it to be 22 ft long 13 ft 11 in broad Ans 582 cts

$$\begin{array}{r} 22 \frac{11}{12} \quad 13 \frac{11}{12} \\ 12 \quad 12 \\ \hline 271 + 164 \times 11 = 45257 \\ 12 + 12 \times 9 = 1296 \\ \hline 45257 \\ 1296 \overline{) 45257} \quad 34 \frac{11}{12} \\ \hline 3888 \\ 6844 \\ 5184 \\ \hline 271 \quad 1193 \\ 164 \quad 1296 \\ \hline 1644 \quad 1296 \\ 1644 \\ \hline 271 \\ 45257 + 15 = 1296 \overline{) 678855} \quad 523 \\ \hline 6480 \\ 3085 \\ 2592 \\ 4238 \\ 3888 \\ \hline 1047 \\ 1296 \end{array}$$

4 The length of a room being 20 ft its breadth 14 ft and height 10 ft how many yards of plastering does it contain deducting a fire place of 4 ft 4 in and two windows each 6 ft 3 ft 2 in Ans 40 2/3

$$\begin{array}{r} 20 \\ 14 = 6 \\ \hline 34 = 6 \\ 69 = 0 \\ 103 \\ \hline 690 \\ 23 \\ \hline 713 \\ 55 = 4 \\ \hline 657 = 8 = 657 \frac{2}{3} \end{array}$$

$$\begin{array}{r} 1973 + 1 = 1973 \\ 8 + 9 = 27 \quad 1973 \\ \hline 189 \end{array}$$

5 The length of a room is 14 ft its breadth 13 ft 2 in and height 9 ft to the under side of the cornice which projects 5 in from the wall on the upper part must meet the ceiling require the quantity of rendering and plastering there being no deductions but for a door the size thereof is 7 ft 4 ft Ans 535 sq yd or 1855 cts

$$\begin{array}{r} 14 = 5 \\ 13 = 2 \\ \hline 55 = 2 \\ 9 = 2 \\ \hline 496 = 6 \\ 13 = 6 \\ \hline 511 = 6 \\ 28 \\ 9)482 \\ 55 = 5 \end{array}$$

6 The circular vaulted roof measures 105 ft in the arch and 27 ft in length what will the plastering come to at 12 cts per yd Ans 387,42

$$\begin{array}{r} 275 = 5 \\ 105 = 6 \\ \hline 6 \frac{1}{2} \overline{) 18928} = 86 \\ 9)29066 \\ 3229 = 6 \\ 12 \\ \hline 38748 \end{array}$$

P. B. Par

What will the white washing of a room come to
arets per yd allowing it to be 30-6 long 20-9 broad
and 10 feet high no deductions being made for
vacuities

Ans 44 shillings 13 pence

$$\begin{array}{r} 24 \text{ 75} \\ 803 \\ \hline 125 \text{ 75} \\ 7323 \\ \hline 9144875 \\ 2182765 \\ \hline 4155 \text{ Ans} \end{array}$$

Pavers Work By H. H. M.

What will the paving
of a foot path come to at 8 pence
per yd the length being 35-4
and the breadth 8-3 Ans 9 pence

$$\begin{array}{r} 35 = 4 \\ 8 = 3 \\ \hline 282 - 8 \\ 800 = 0 \\ \hline 9 \overline{) 1290 - 8 = 0} \\ 323 \\ 2 \\ \hline 2594 \\ 646 \\ \hline 9034 \\ 225 \\ \hline 90490 \text{ Ans} \end{array}$$

What cost the paving of a room
yard at 3 pence per yd the length
being 24-10 and the breadth 14-9

Ans 148 shillings

$$\begin{array}{r} 24-10 \\ 14-9 \\ \hline 144 = 9 \\ 389 - 8 \\ 20 = 10 - 6 \\ \hline 9 \overline{) 1410 - 6 = 6} \\ 43 \overline{) 45} = 1 \text{ 6} = 6 \\ 1 \overline{) 1360} \\ 4 \overline{) 135} \\ 6 \overline{) 11410} \\ 2 \overline{) 11} \\ 12 \\ \hline 17538 \text{ Ans} \end{array}$$

What will be the expense
of paving a rectangular yard whose
length is 60 ft and breadth 45 ft
in which there is laid a foot
path 5-8 broad running the
whole length with broad stones
at 86 pence per yd the rest to
be paved with pebbles at 30
pence a yd Ans 96 shillings 5 pence

$$\begin{array}{r} 3975 \\ 63 \\ \hline 9 \overline{) 11925} \\ 28850 \\ \hline 250425 \\ 2 \overline{) 248 - 2 \frac{1}{2}} \\ 30 \\ \hline 8346 \frac{1}{2} \\ 3 \frac{1}{2} \\ 33 \\ 5 \\ \hline 83475 \frac{1}{2} \\ 1325 \frac{1}{2} \\ \hline 896703 \end{array}$$

$$\begin{array}{r} 45 = 3 \\ 39 = 9 \\ \hline 225 \\ 62 \\ \hline 1575 \\ 8150 \\ \hline 9 \overline{) 83075} \\ 81366 \frac{3}{4} \\ \hline 1708 \frac{1}{4} \\ 216 \\ 12 \\ 12 \\ 3 \\ \hline 81323 \end{array}$$

Painters RULE

Work By W. H.

A gentleman had a room painted being 24-6 its breadth 16-3 and at 48 cts per yd the measure whereof is as follows. With the height 11-4 the compass 14-10 the door 4-6 by 3-9 five window shutters each 8-8 by 3-4 the breaks in the window 14 ft deep and 8 ft high the opening for the chimney 0-9 by 5-6 to be deducted the shutters deducting a fire place of and doors are painted on both sides what 5 by 5-6 cts 14 cts 14 1/2

What cost the painting of a room at 6 cts per yd its length 24-6 its breadth 16-3 and its height 11-4 also the door is 4 ft by 3-6 and the window shutters of two windows each 8-8 by 3-4 but the breaks of the windows themselves are 8-8 high and 1 foot 3 inches deep

will the whole come to cts 10 1/2 sets

74=10 11=4	7=6 39	6=8 3=4	8 1=2	3=4 1=2
828=2 48=7-10	22=6 5=7-6	20=0 2=2-8	8 1=4	3=4 6=8
866=9-10 28=1-6	28=1-6	22=2-8 5	9=4 2	3=10-8
111=1-4 32=2-8		111=8-4 18=8 9=9-4	26=5-4 5	7=9=6
138=3-4 33=9			132=2-8	
91104=6-4 6222=6-2				
1042163				

24=6
16=3
40=5
81=6
12=9
978=0
61=1-6
1039=1-6
24=6=0
27=1-6
21=3=0
91112=0-0
128=5
4/1738
1/1
741 cts

How many yards of painting are there in a room the length whereof is 20 ft its breadth 14-6 and height 10-2 deducting a fire place of 4 ft by 4-6 and two windows each 6 ft by 3-2 cts 17 3/4 cts

4=4 14=4	20 14=6 34=6 2	3=2 6 19=0 2
	69=0 10=4	38=0 14=4
	690=0 23=0-0	5-5=4
	713=0-0 55=4-0	
	657=8-0	

1973 x 1 = 1973
3 + 9 = 27
189
83
81
2
27

2^d
York

5 ~~What will the glazing~~
What is the area of an elliptical
fan light of 14-6 in length and
4-9 in breadth and 68-10 inches

$$\begin{array}{r} 14 = 6 \\ \quad 4 = 9 \\ \hline 38 = 0 \\ 90 - 10 = 6 \\ \hline 68 - 10 = 6 \end{array}$$

6 There is a house with three tiers of windows 3 in a tier the height of the first tier is $11 - 10^{\text{in}}$ of the second $6 - 8^{\text{in}}$ of the third $5 - 4^{\text{in}}$ and the common breadth $8 - 11^{\text{in}}$ what will the glazing come to at 14 cts per foot / \$ 269 7/8 7/16

$7 = 10$ $3 = 11$	$6 = 8$ $8 = 11$	$5 = 4$ $3 = 11$
$23 = 6$ $7 = 2 = 2$	$28 = 0$ $6 = 1 = 4$	$16 = 0$ $4 = 10 = 8$
$30 = 8 = 2$ 9	$26 = 1 = 4$ 9	$20 = 10 = 8$ 9
$276 = 1 = 6$ $188 = 0 = 0$ $235 = 0 = 0$	$235 = 0 = 0$	$188 = 0 = 0$
$699 = 1 = 6$ 14		

$1 \overline{) 14796}$
 $6 \overline{) 6991}$
 $5 -$
 978457

$1404.8 = 0$
 14
 1616
 1404
 202
 5858
 3
 58610

4 what will the glazing
 of a triangular sky light
 come to at 10 cts per foot
 the base being 15 ft long
 and the perpendicular height 6 ft
 Ans \$10.43 $\frac{8}{10}$ Cts

$$\begin{array}{r}
 14 \\
 1 \overline{) 14.796} \\
 \underline{14} \\
 0 \\
 6 \\
 \underline{6} \\
 0 \\
 2 \\
 \underline{2} \\
 0 \\
 9 \\
 \underline{9} \\
 0 \\
 8 \\
 \underline{8} \\
 0 \\
 5 \\
 \underline{5} \\
 0
 \end{array}$$

2
H S

$16 = 9$
 $12 = 6$
 $201 = 0$
 $8 = 4 = 6$
 $3 \overline{) 209} = 4 = 6$
 $8 \overline{) 2} \mid 104 = 8 = 3$
 $3 \overline{) 16} \mid 1040$
 333
 333
 22
 $888 \mid 104588$
 888
 888

930²
 930
 0900

69/3

09
56

$$\sqrt{2} = 2$$

Measurement of ground Rule

2 In a square field each side of which measures 35 two pole chains how many

$$\begin{array}{r} 35 \\ 40 \overline{) 1400} \\ \underline{120} \\ 200 \\ \underline{160} \\ 40 \end{array} \text{Ans } 20$$

3 A piece of square ground measures 16 1/2 perches on each side what is the content in acres

$$\begin{array}{r} 16.5 \\ 40 \overline{) 272.25} \\ \underline{160} \\ 112.25 \\ \underline{112} \\ 25 \end{array} \text{Ans } 6.8225$$

Rule

2 In a piece of ground lying in the form of an oblong square the length measures 120 perches and the breadth 84 what is its content in acres

$$\begin{array}{r} 120 \\ 84 \\ \hline 9600 \\ 40 \overline{) 9600} \\ \underline{8000} \\ 1600 \\ \underline{1600} \\ 0 \end{array} \text{Ans } 63$$

3 A lot of ground lying in the form of an oblong square measure 240 ft in length and 120 ft in breadth what is its content in acres

$$\begin{array}{r} 240 \\ 120 \\ \hline 28800 \\ 40 \overline{) 28800} \\ \underline{24000} \\ 4800 \\ \underline{4800} \\ 0 \end{array} \text{Ans } 66$$

2 In a triangular piece of ground the base or longest side is 75 perches and the perpendicular 50 how many acres does it contain

$$\begin{array}{r} 75 \\ 40 \overline{) 1875} \\ \underline{1200} \\ 675 \\ \underline{675} \\ 0 \end{array} \text{Ans } 11.25$$

3 How much will a triangular piece of come to at 45 p per acre the longest side or base of which measures 120 perches and the perpendicular 84

$$\begin{array}{r} 84 \\ 40 \overline{) 5040} \\ \underline{4000} \\ 1040 \\ \underline{1040} \\ 0 \end{array} \text{Ans } 141.75$$

4 How many superficial yds are contained in a triangular piece of ground the base of which measures 140 ft and perpendicular 110 ft

$$\begin{array}{r} 140 \\ 110 \\ \hline 15400 \\ 40 \overline{) 15400} \\ \underline{12000} \\ 3400 \\ \underline{3400} \\ 0 \end{array} \text{Ans } 385$$

Rule

1 A piece of ground lying in the form of an oblique parallelogram is found to measure 40 along its base and its perpendicular high 24 how many acres does it contain

$$\begin{array}{r} 40 \\ 24 \\ \hline 960 \\ 40 \overline{) 960} \\ \underline{800} \\ 160 \\ \underline{160} \\ 0 \end{array} \text{Ans } 12$$

Measurement of ground

Rule

In a field of 4 equal sides the diagonal line between the most distant measure 120 rods and the perpendiculars measure the ones 8 and the other 24 rods require the measure of a circle it contains *Ans* 24 *ac*

$$\begin{array}{r} 120 \\ 72 \\ \hline 240 \\ 840 \\ \hline 2)8640 \\ 4320 \\ \hline 4)1088 \\ 272 \end{array}$$

Rule 2 A gentleman has an elliptical yard in front of his house the longest diameter of which measures 30 perches and the shortest 20 how much ground is contained there in *Ans* 234 *sq* ft

Of Gauging

Rule

The diameter of a bbl at the bung measures 24 at the 18 inches and its length is 24 inches what is its content in wine measure *Ans* 32 *gal*

$$\begin{array}{r} 6 \frac{2}{3} \quad 78 \\ 22 \\ \hline 24 \\ 44 \\ \hline 44 \\ 484 \\ \hline 24 \\ 1936 \\ 168 \end{array}$$

$$\begin{array}{r} 24 \\ 18 \\ \hline 6 \end{array}$$

$$\begin{array}{r} 294)11616(39 \frac{25}{49} \text{ Ans} \\ 882 \\ \hline 2796 \\ 2646 \\ \hline 150 = 25 \\ 6)294 = 49 \end{array}$$

Measurement

$$\begin{array}{r} 30 \\ 20 \\ \hline 600 \\ 40)471,2400 \\ 4)111 = 312 \\ 2 = 3 = 31,2 \text{ Ans} \end{array}$$

3 How many square yds are contained in a circular piece of ground the diameter of which measures 160 ft *Ans* 2234 *sq* yds

$$\begin{array}{r} 160 \\ 160 \\ \hline 1600 \\ 160 \\ \hline 25600 \end{array}$$

$$\begin{array}{r} 3854 \\ 25600 \end{array}$$

$$4712400$$

$$39270$$

$$15708$$

$$920105,24$$

$$22347 \text{ Ans}$$

W H

Miscellaneous Questions

1 What is the sum of 2578 added to its self

$$\begin{array}{r} 2578 \\ 2578 \\ \hline 5156 \end{array} \text{Ans}$$

2 What is the difference between 14696 and the $\frac{1}{2}$ of its self

$$\begin{array}{r} 14696 \\ 7348 \\ \hline 11007 \end{array} \text{Ans}$$

3 There is the sum of 14688 in three bags the first contains 461 the second 581 how many are there in the third bag

$$\begin{array}{r} 14688 \\ 461 \\ 581 \\ \hline 14266 \end{array} \text{Ans}$$

4 What is the sum of the third and half third of a dollar

$$\begin{array}{r} 1.00 \\ 0.33 \\ \hline 1.33 \end{array} \text{Ans}$$

5 What number is that what which being multiplied by 45 the product will be equal to 1080

$$\begin{array}{r} 1080 \\ 45 \\ \hline 24 \end{array} \text{Ans}$$

6 Require the quotient of the square of 476 divided by half of its root

$$\begin{array}{r} 476 \\ 476 \\ \hline 2856 \\ 2856 \\ \hline 0 \end{array} \text{Ans}$$

7 A general drawing up his army into a solid square found he had 21 over and above but increasing each side with one soldier he wanted 44 to couple the square

How many men did his army consist of

$$\begin{array}{r} 19000 \\ 200 \\ 200 \\ 40000 \\ 231 \\ 40231 \\ 40401 \\ 44 \\ 40357 \\ 40231 \\ \hline 126 \\ 326 \\ 126 \\ 220 \\ 137 \\ 137 \\ 959 \\ 411 \\ 137 \\ 18769 \\ 231 \\ \hline 190000 \end{array} \text{Ans}$$

8 What number added to the cube of 21 will make the sum equal to 113 times 144

$$\begin{array}{r} 144 \\ 113 \\ \hline 16272 \\ 16272 \\ \hline 0 \end{array} \text{Ans}$$

9 A person possessed of $\frac{3}{8}$ of a ship sold $\frac{3}{8}$ of his share for 1260 what was the value of the whole ship at the same rate

$$\begin{array}{r} 1260 \\ 3 \\ \hline 420 \\ 420 \\ \hline 840 \end{array} \text{Ans}$$

Promiscuous

10 A guardian paid his ward 3500
\$ for 2500\$ which he had in his hand
for 8 years what rate of interest
did he allow him *Ans* 5 per cent

$$\begin{array}{r} 3500 \\ 2500 \\ \hline 2500 : 10000 : 100 \\ 100 \\ \hline 2500 : 10000 : 00 (8) 40 \\ 100 \end{array}$$

11 A young man received 210
\$ which was $\frac{2}{5}$ of his elder brother's
share now three times the elder
brother's portion was half the
father's estate how ~~many~~ much
was the estate worth *Ans* 1890 *Ans*

$$\begin{array}{r} 210 \\ 2 \overline{) 830} \\ 315 \\ \hline 945 \\ 2 \\ \hline 1890 \end{array}$$

12 A broker bought for his
principal in the year 1820 the
sum of 400\$ capital stock in
the south sea at 85 per cent
and sold it again when it was
worth but 130 per cent how much
was the loss on the whole *Ans* 2080

$$\begin{array}{r} 100 : 130 : 400 \\ 40 \\ \hline 100 \overline{) 5200} \\ 520 \end{array}$$

$$\begin{array}{r} 100 : 650 : 400 \\ 400 \\ \hline 100 \overline{) 26000} \\ 2600 \end{array}$$

$$\begin{array}{r} 2600 \\ 520 \\ \hline 2080 \end{array}$$

Questions By

13 A gentleman went to
sea at 14 years of age & dyed
after he had a son born
who lived 46 years and
dyed before his father
after whom the father lived
twice 20 and then dyed
also I demand the age
of the father when he dyed
Ans 111 *Ans*

$$\begin{array}{r} 14 \\ 8 \\ \hline 46 \\ 46 \\ \hline 111 \end{array}$$

14 A B and C entered
into partnership in trade
A put in a sum unknown
B put in 20 pieces of cloth
and C put in 500\$ at the
end of one year they had
gained 1000\$ whereof C
received 500\$ for his share
and B took for his share
1000\$ require C's share
how much A put in and
the value of B's cloth
Ans C's share 250\$
A put in 1400\$ B's cloth

$$\begin{array}{r} 350 \quad 1000 \\ 400 \quad 450 \\ \hline 750 \end{array}$$

$$\begin{array}{r} 250 : 500 : 1000 \\ 250 \overline{) 1500} \\ 1500 \end{array}$$

$$\begin{array}{r} 250 : 500 : 1400 \\ 400 \\ \hline 250 \overline{) 20800} \\ 20800 \end{array}$$

James O Promiscuous Questions

15 A captain and 100 sailors took prize worth 24208 of which the captain gets $\frac{1}{5}$ for his share and the rest equally divided among the sailors what was each ones part etc the captain gets 4840 and each sailor gets 1386 etc

$$\begin{array}{r} 24208 \\ \times \frac{1}{5} \\ \hline 4841.6 \\ \text{Ans } 4840 \end{array}$$

$$\begin{array}{r} 100 \overline{) 24208} \\ 100 \times 242 = 24200 \\ \hline 8 \end{array}$$

$$\begin{array}{r} 8 \\ \times 1386 \\ \hline 11088 \\ 27720 \\ \hline 11088 \\ \hline 0 \end{array}$$

Suppose $\frac{1}{2}$ of a mas or pole stands in the ground 12 ft in the water and $\frac{1}{3}$ of its length above the water what is its whole length Ans 216

$$\begin{array}{r} 12 \\ \times \frac{2}{3} \\ \hline 8 \\ \times 27 \\ \hline 216 \end{array}$$

16 A lady tells her husband upon their marriage that her fortune the interest of which for one year at 6 per cent was 9728 was but $\frac{2}{3}$ of the interest of her fathers estate for three years at the same rate per cent what was the ladys fortune and what was the fathers estate etc her fortune was 16000 and her fathers estate was 150000

17 A gentleman being asked his age answered my grandfathers 112 years old and my father is $\frac{1}{4}$ of his age whilst mine is but $\frac{1}{3}$ of my fathers what was his age

$$\begin{array}{r} 112 \\ \times \frac{1}{4} \\ \hline 28 \end{array}$$

Ans 28

6:100::972

$$\begin{array}{r} 6 \overline{) 97200} \\ 6 \times 16200 = 97200 \\ \hline 0 \end{array}$$

Ans 16200

18 A person who was possessed therein for 17108 what was the value of the property at the same rate Ans 38008

$$\begin{array}{r} 17108 \\ \times \frac{1}{4} \\ \hline 4277 \end{array}$$

Ans 38008

19 A stone measures 4 ft 6 inches long 2 ft 5 inches broad and 3 ft 4 inches deep how many cubic feet does it contain Ans 41.5

$$\begin{array}{r} 4 \text{ ft } 6 \text{ in} = 4.5 \text{ ft} \\ 2 \text{ ft } 5 \text{ in} = 2.416 \text{ ft} \\ 3 \text{ ft } 4 \text{ in} = 3.333 \text{ ft} \\ \hline 41.5 \end{array}$$

Promiscuous Questions

21 There are two numbers the one is the other half as much require the product of their squares and and the difference of their product and sum Ans { Product of their squares 3838 2400 Difference 1890

$$\begin{array}{r} 2163 \\ 315 \\ \hline 9105 \end{array}$$

$$\begin{array}{r} 315 \\ 63 \\ \hline 945 \end{array}$$

$$\begin{array}{r} 1890 \\ 945 \\ \hline 1890 \end{array}$$

$$\begin{array}{r} 1890 \\ 945 \\ \hline 1890 \end{array}$$

$$\begin{array}{r} 63 \\ 63 \\ \hline 189 \end{array}$$

$$\begin{array}{r} 189 \\ 378 \\ \hline 567 \end{array}$$

$$\begin{array}{r} 378 \\ 8967 \end{array}$$

Difference

$$\begin{array}{r} 315 \\ 315 \\ \hline 7575 \end{array}$$

$$\begin{array}{r} 7575 \\ 315 \\ \hline 945 \end{array}$$

$$\begin{array}{r} 945 \\ 945 \\ \hline 945 \end{array}$$

$$\begin{array}{r} 945 \\ 945 \\ \hline 945 \end{array}$$

$$\begin{array}{r} 945 \\ 945 \\ \hline 945 \end{array}$$

$$\begin{array}{r} 945 \\ 945 \\ \hline 945 \end{array}$$

$$\begin{array}{r} 945 \\ 945 \\ \hline 945 \end{array}$$

$$\begin{array}{r} 945 \\ 945 \\ \hline 945 \end{array}$$

22 Two men set at the same time from the same Place but go contrary ways and each of them travel 34 miles a day require the time in which they will have traveled 2000 Miles

$$\begin{array}{r} 34 \\ 34 \\ \hline 68 \end{array}$$

$$\begin{array}{r} 68 \\ 68 \\ \hline 136 \end{array}$$

$$\begin{array}{r} 136 \\ 136 \\ \hline 272 \end{array}$$

$$\begin{array}{r} 272 \\ 272 \\ \hline 544 \end{array}$$

$$\begin{array}{r} 544 \\ 544 \\ \hline 1088 \end{array}$$

$$\begin{array}{r} 1088 \\ 1088 \\ \hline 2176 \end{array}$$

$$\begin{array}{r} 2176 \\ 2176 \\ \hline 4352 \end{array}$$

$$\begin{array}{r} 4352 \\ 4352 \\ \hline 8704 \end{array}$$

$$\begin{array}{r} 8704 \\ 8704 \\ \hline 17408 \end{array}$$

$$\begin{array}{r} 17408 \\ 17408 \\ \hline 34816 \end{array}$$

$$\begin{array}{r} 34816 \\ 34816 \\ \hline 69632 \end{array}$$

$$\begin{array}{r} 69632 \\ 69632 \\ \hline 139264 \end{array}$$

$$\begin{array}{r} 139264 \\ 139264 \\ \hline 278528 \end{array}$$

$$\begin{array}{r} 278528 \\ 278528 \\ \hline 557056 \end{array}$$

$$\begin{array}{r} 557056 \\ 557056 \\ \hline 1114112 \end{array}$$

$$\begin{array}{r} 1114112 \\ 1114112 \\ \hline 2228224 \end{array}$$

$$\begin{array}{r} 2228224 \\ 2228224 \\ \hline 4456448 \end{array}$$

$$\begin{array}{r} 4456448 \\ 4456448 \\ \hline 8912896 \end{array}$$

$$\begin{array}{r} 8912896 \\ 8912896 \\ \hline 17825792 \end{array}$$

$$\begin{array}{r} 17825792 \\ 17825792 \\ \hline 35651584 \end{array}$$

$$\begin{array}{r} 35651584 \\ 35651584 \\ \hline 71303168 \end{array}$$

$$\begin{array}{r} 71303168 \\ 71303168 \\ \hline 142606336 \end{array}$$

$$\begin{array}{r} 142606336 \\ 142606336 \\ \hline 285212672 \end{array}$$

$$\begin{array}{r} 285212672 \\ 285212672 \\ \hline 570425344 \end{array}$$

$$\begin{array}{r} 570425344 \\ 570425344 \\ \hline 1140850688 \end{array}$$

$$\begin{array}{r} 1140850688 \\ 1140850688 \\ \hline 2281701376 \end{array}$$

$$\begin{array}{r} 2281701376 \\ 2281701376 \\ \hline 4563402752 \end{array}$$

$$\begin{array}{r} 4563402752 \\ 4563402752 \\ \hline 9126805504 \end{array}$$

23 If a cannon may be discharged twice with 6 lb of powder how many times will it cut 8 lb 17 lb discharge at the same price

$$6 \times 2 = 12$$

$$12 \times 17 = 204$$

$$204 \div 8 = 25.5$$

$$25.5 \times 17 = 433.5$$

$$433.5 \div 17 = 25.5$$

$$25.5 \times 17 = 433.5$$

$$433.5 \div 17 = 25.5$$

$$25.5 \times 17 = 433.5$$

$$433.5 \div 17 = 25.5$$

$$25.5 \times 17 = 433.5$$

$$433.5 \div 17 = 25.5$$

$$25.5 \times 17 = 433.5$$

$$433.5 \div 17 = 25.5$$

$$25.5 \times 17 = 433.5$$

$$433.5 \div 17 = 25.5$$

$$25.5 \times 17 = 433.5$$

$$433.5 \div 17 = 25.5$$

$$25.5 \times 17 = 433.5$$

$$433.5 \div 17 = 25.5$$

$$25.5 \times 17 = 433.5$$

$$433.5 \div 17 = 25.5$$

$$25.5 \times 17 = 433.5$$

24 What number is that to which if you add 2 of itself the sum will be 120 Ans 120

$$\begin{array}{r} 20 \\ 20 \\ \hline 40 \end{array}$$

$$\begin{array}{r} 40 \\ 40 \\ \hline 80 \end{array}$$

$$\begin{array}{r} 80 \\ 80 \\ \hline 160 \end{array}$$

$$\begin{array}{r} 160 \\ 160 \\ \hline 320 \end{array}$$

$$\begin{array}{r} 320 \\ 320 \\ \hline 640 \end{array}$$

$$\begin{array}{r} 640 \\ 640 \\ \hline 1280 \end{array}$$

$$\begin{array}{r} 1280 \\ 1280 \\ \hline 2560 \end{array}$$

$$\begin{array}{r} 2560 \\ 2560 \\ \hline 5120 \end{array}$$

$$\begin{array}{r} 5120 \\ 5120 \\ \hline 10240 \end{array}$$

$$\begin{array}{r} 10240 \\ 10240 \\ \hline 20480 \end{array}$$

$$\begin{array}{r} 20480 \\ 20480 \\ \hline 40960 \end{array}$$

$$\begin{array}{r} 40960 \\ 40960 \\ \hline 81920 \end{array}$$

$$\begin{array}{r} 81920 \\ 81920 \\ \hline 163840 \end{array}$$

25 What number is that which being divided by 2 the quotient will be 21 Ans 15 1/2

$$\begin{array}{r} 21 \\ 21 \\ \hline 42 \end{array}$$

$$\begin{array}{r} 42 \\ 42 \\ \hline 84 \end{array}$$

$$\begin{array}{r} 84 \\ 84 \\ \hline 168 \end{array}$$

$$\begin{array}{r} 168 \\ 168 \\ \hline 336 \end{array}$$

$$\begin{array}{r} 336 \\ 336 \\ \hline 672 \end{array}$$

$$\begin{array}{r} 672 \\ 672 \\ \hline 1344 \end{array}$$

$$\begin{array}{r} 1344 \\ 1344 \\ \hline 2688 \end{array}$$

$$\begin{array}{r} 2688 \\ 2688 \\ \hline 5376 \end{array}$$

$$\begin{array}{r} 5376 \\ 5376 \\ \hline 10752 \end{array}$$

$$\begin{array}{r} 10752 \\ 10752 \\ \hline 21504 \end{array}$$

$$\begin{array}{r} 21504 \\ 21504 \\ \hline 43008 \end{array}$$

26 What number is that which being multiplied by 15 the product will be 225 Ans 15

$$\begin{array}{r} 15 \\ 15 \\ \hline 30 \end{array}$$

$$\begin{array}{r} 30 \\ 30 \\ \hline 45 \end{array}$$

$$\begin{array}{r} 45 \\ 45 \\ \hline 60 \end{array}$$

$$\begin{array}{r} 60 \\ 60 \\ \hline 75 \end{array}$$

$$\begin{array}{r} 75 \\ 75 \\ \hline 90 \end{array}$$

$$\begin{array}{r} 90 \\ 90 \\ \hline 105 \end{array}$$

$$\begin{array}{r} 105 \\ 105 \\ \hline 120 \end{array}$$

$$\begin{array}{r} 120 \\ 120 \\ \hline 135 \end{array}$$

$$\begin{array}{r} 135 \\ 135 \\ \hline 150 \end{array}$$

$$\begin{array}{r} 150 \\ 150 \\ \hline 165 \end{array}$$

27 What number is that from which if you take 2 the remainder will be 28 Ans 30

$$\begin{array}{r} 30 \\ 30 \\ \hline 60 \end{array}$$

$$\begin{array}{r} 60 \\ 60 \\ \hline 120 \end{array}$$

$$\begin{array}{r} 120 \\ 120 \\ \hline 240 \end{array}$$

$$\begin{array}{r} 240 \\ 240 \\ \hline 480 \end{array}$$

$$\begin{array}{r} 480 \\ 480 \\ \hline 960 \end{array}$$

$$\begin{array}{r} 960 \\ 960 \\ \hline 1920 \end{array}$$

$$\begin{array}{r} 1920 \\ 1920 \\ \hline 3840 \end{array}$$

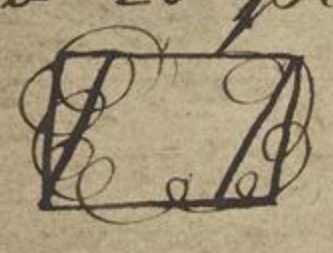
Same as before
 Nicholas is King of Russia Victoria is Queen
 M. W. D. Richards is my name 1844

Nicholas is King of Russia Victoria Queen of England
 M. W. D. Richards is my name 1844

281 What number is that whose half is equal to its square
 Ans. 5
 $\frac{1}{2} \times 6 = 3$ $\frac{6}{36}$
 Dup 6

36 : 3 : 6
 36 : 18 : 6
 7 : 1 : 1 = $\frac{1}{7}$
 12 : 1 : 1 = $\frac{1}{12}$
 $\frac{1}{7} \times \frac{1}{12} = \frac{1}{84}$ 1911 : 184

43 How many acres are contained in a square field the diagonal of which is 20 perches more than either of its sides



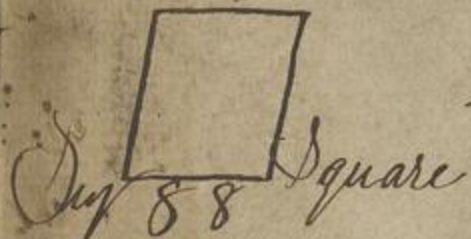
211.414
 24 | 100
 96
 4
 281 | 2.00
 281
 19
 414 : 1 :: 20 : 48.3
 2824 | 11900
 48.3
 48.3
 1449
 3864
 1932
 40 | 233.289
 4 | 58 = 12
 14 - 2 = 12
 12
 nearly

44

$$\begin{array}{r} 18 \overline{) 100} \\ 20 \\ \hline 2000 \\ 12 \\ \hline \end{array}$$

$$18 \overline{) 24000} 1333.33$$

$$\begin{array}{r} 2744^2 + 303030^2 \\ 44 \overline{) 303030} \\ 1936 \overline{) 9180900} \\ 1936 \end{array}$$



$$\begin{array}{r} 2 \overline{) 88} \\ 44 \end{array}$$

$$\begin{array}{r} 44 \overline{) 1333.33} 30.3030 \\ 132 \\ \hline 133 \\ 132 \\ \hline 1 \end{array}$$

$$103 \overline{) 354} 309$$

$$1064 \overline{) 4509} 4256$$

$$10682$$



$$\begin{array}{r} 53.42 \\ 106.84 \text{ Ans} \end{array}$$

45

$$\begin{array}{r} 2 \overline{) 1160} \\ 80 \overline{) 18.95} \\ 64 \end{array}$$

$$\begin{array}{r} 169 \overline{) 1660} \\ 1321 \\ \hline 1785 \overline{) 9900} \\ 8925 \end{array}$$

$$\begin{array}{r} 1.128 \\ 8.95 \\ 5640 \\ 10132 \\ 9024 \\ \hline 2 \overline{) 6.0936} \\ 5.0468 \\ 8 \frac{1}{2} \end{array}$$

$$\begin{array}{r} 252840 \\ 259 \\ \hline 29.45 \text{ Ans} \end{array}$$

48

$$\begin{array}{l} \left(\frac{5}{4}\right) = \frac{25}{16} \\ \left(\frac{7}{8}\right) = \frac{49}{64} \end{array}$$

$$\begin{array}{r} 20 \\ 72 \\ \hline 240 \\ 25 \\ \hline 1200 \\ 480 \\ \hline 6000 \\ 64 \end{array}$$

$$\begin{array}{r} 50 \\ 12 \\ \hline 600 \\ 16 \\ \hline 9600 \\ 49 \\ \hline 86400 \\ 38400 \end{array}$$

$$384000 : 1120 :: 470400$$

50

$$\begin{array}{r} 24 \\ 9 \\ \hline 216 \overline{) 6 \times \frac{4}{3}} \\ 216 \overline{) 8} \\ 8 \\ \hline 64 \\ 4 \\ \hline 3160 \\ 12 \\ \hline 8 \\ 96 \\ \hline 103 \text{ Ans} \end{array}$$

$$\begin{array}{r} 384 \overline{) 526848.000} 1372 \\ 384 \\ \hline 1428 \\ 1152 \\ \hline 2784 \\ 2688 \\ \hline 96 \\ 96 \\ \hline \end{array}$$

$$\begin{array}{r} 411.6 \\ 686 \\ \hline 12 \overline{) 4802} \\ 20 \overline{) 400} = 20 \\ 20 = 0 = 2 \\ \hline \text{Ans} \end{array}$$

51

$$\frac{5150}{10}$$

$$\begin{array}{r} \frac{1}{10} | 500 \\ \frac{1}{10} | 50 \\ \frac{1}{10} | 450 \\ \frac{1}{10} | 45 \\ \frac{1}{10} | 405 \\ \frac{1}{10} | 405 \\ \frac{1}{10} | 364.5 \\ \frac{1}{10} | 364.5 \\ \hline 328.05 \\ 328.05 \\ \hline 295.245 = 295 = 1 \text{ wine} \end{array}$$

gall
500 qt
 $\frac{295}{204} = 1$
204 = 3 water

58

$$\begin{array}{r} 34 \overline{) 1186} \\ \underline{34} \\ 84 \\ \underline{50} \\ 34 \\ \underline{34} \\ 0 \end{array}$$

34) 1032 (3 = 1 $\frac{10}{17}$ Ans

$$\begin{array}{r} 1 2 \\ \underline{80} \\ 360 \\ \underline{34} \\ 220 = 20 \\ \underline{34} = 17 \end{array}$$

59

$$\begin{array}{r} 4: 7: 6 \\ 4 \overline{) 42} \\ \underline{4} \\ 0 \end{array}$$

5 = A
7 = B
10 $\frac{1}{2}$ = C
22 $\frac{1}{2}$ Durr

22.5 : 240 : 5 = 53.3 + A
22.5 : 240 : 7 = 74.6 + B
22.5 : 240 : 10 $\frac{1}{2}$ = 112 - C Ans

64

boy

$$\begin{array}{l} 1 \times 6 = 6 \\ 3 \times 8 = 24 \\ 6 \times 16 = 96 \end{array}$$

$$\begin{array}{r} 126 : 1890 : 24 \\ \underline{24} \\ 7560 \\ \underline{3780} \\ 126 \overline{) 45360} (360 \\ \underline{378} \\ 756 \\ \underline{756} \\ 0 \end{array}$$

$$\begin{array}{r} 126 : 1890 : 6 \\ \underline{6} \\ 126 \overline{) 11340} (90 \\ \underline{1134} \\ 0 \end{array}$$

$$\begin{array}{r} 126 : 1890 : 96 \\ \underline{96} \\ 11340 \\ \underline{17010} \\ 126 \overline{) 181440} (1440 \\ \underline{126} \\ 554 \\ \underline{504} \\ 504 \\ \underline{504} \\ 0 \end{array}$$

$$\begin{array}{r} 6 \overline{) 90} \\ \underline{15} \text{ boys} \\ 8 \overline{) 360} \\ \underline{48} \text{ women } 90 \\ 16 \overline{) 1440} \\ \underline{90} \text{ men } 1890 \end{array}$$

Proof

68

$$\begin{array}{r} 9.5 \\ 6.75 \\ \hline 2.75 : 1 : : \end{array} \quad \begin{array}{r} 4.8 = m \\ 1.2 \\ \hline 546.75 \\ 539.25 \end{array}$$

$$\begin{array}{r} 275 \overline{) 539.25} \quad 196 \frac{1}{11} \text{ Days} \\ \underline{275} \\ 2642 \\ \underline{2475} \\ 1675 \\ \underline{1650} \\ 25 \end{array} \quad \begin{array}{r} 25 \overline{) 25} = \frac{1}{11} \end{array}$$

69

$$\begin{array}{r} 2 \overline{) \frac{1}{2} \frac{1}{5} \frac{1}{8} \frac{1}{9}} \\ \underline{15} \quad 49 \\ \underline{5} \\ 20 \\ \underline{180} \end{array}$$

$$\begin{array}{r} 2 \quad 360 = 180 \\ 5 \quad 72 \\ 8 \quad 45 \\ 9 \quad 40 \end{array}$$

$$\frac{360}{360} - \frac{337}{360} = \frac{23}{360}$$

$$23 : 1 : 360$$

$$\begin{array}{r} 360 \\ 46 \\ \hline 2160 \\ 1440 \\ \hline 23 \overline{) 16560} \quad 720 \\ \underline{46} \\ 46 \\ \hline 0 \end{array} \quad \text{Ans}$$

70

$$\begin{array}{r} \text{Sup } 200 \\ 94 \\ \hline 106 \\ \frac{1}{2} \overline{) 106} \\ \underline{53} \\ 53 \\ \hline 21.2 \\ 94 \\ \hline 168.2 \end{array} \quad \begin{array}{r} 204 \\ 10 \overline{) 1800} \\ \underline{180} \\ 168.2 \\ 11.8 \text{ er} \end{array}$$

Sup 100

$$\begin{array}{r} 100 \\ 94 \\ \hline 6 \\ \frac{1}{2} \overline{) 6} \\ \underline{3} \\ 3 \\ \hline 1.2 \\ 94 \\ \hline 98.2 \\ 80 \\ \hline 8.2 \text{ er} \end{array} \quad \begin{array}{r} 104 \\ 10 \overline{) 1900} \\ \underline{90} \end{array}$$

$$\begin{array}{r} 100 \\ 8.2 \\ \hline 820 \\ 16400 \\ \hline 11800 \end{array} \quad \begin{array}{r} 11.8 \\ 100 \\ \hline 11800 \end{array}$$

72

$$\begin{array}{r} 8.2 \\ 200 \\ \hline 16400 \\ 11800 \\ \hline 20 \overline{) 2820} \\ \underline{141} \end{array} \quad \text{Ans}$$

$$\begin{array}{r} 4 \\ 3 \\ \hline 12 \\ 2 \\ \hline 24 \text{ er} \end{array}$$

$$\begin{array}{r} 4 \\ 8 \\ \hline 24 \\ \text{inner 4 er.} \end{array}$$

$$\begin{array}{r} 3.14^+ \\ 24 \\ \hline 1256 \\ 625 \\ \hline 75.06 \end{array} \quad \begin{array}{r} 3.14^+ \\ 16 \\ \hline 18.84 \\ 314 \\ \hline 50.24 \end{array}$$

Handwritten mathematical calculations and notes on aged paper, including various numbers, fractions, and algebraic expressions. The page is heavily crossed out with diagonal lines.

Top section (partially obscured):

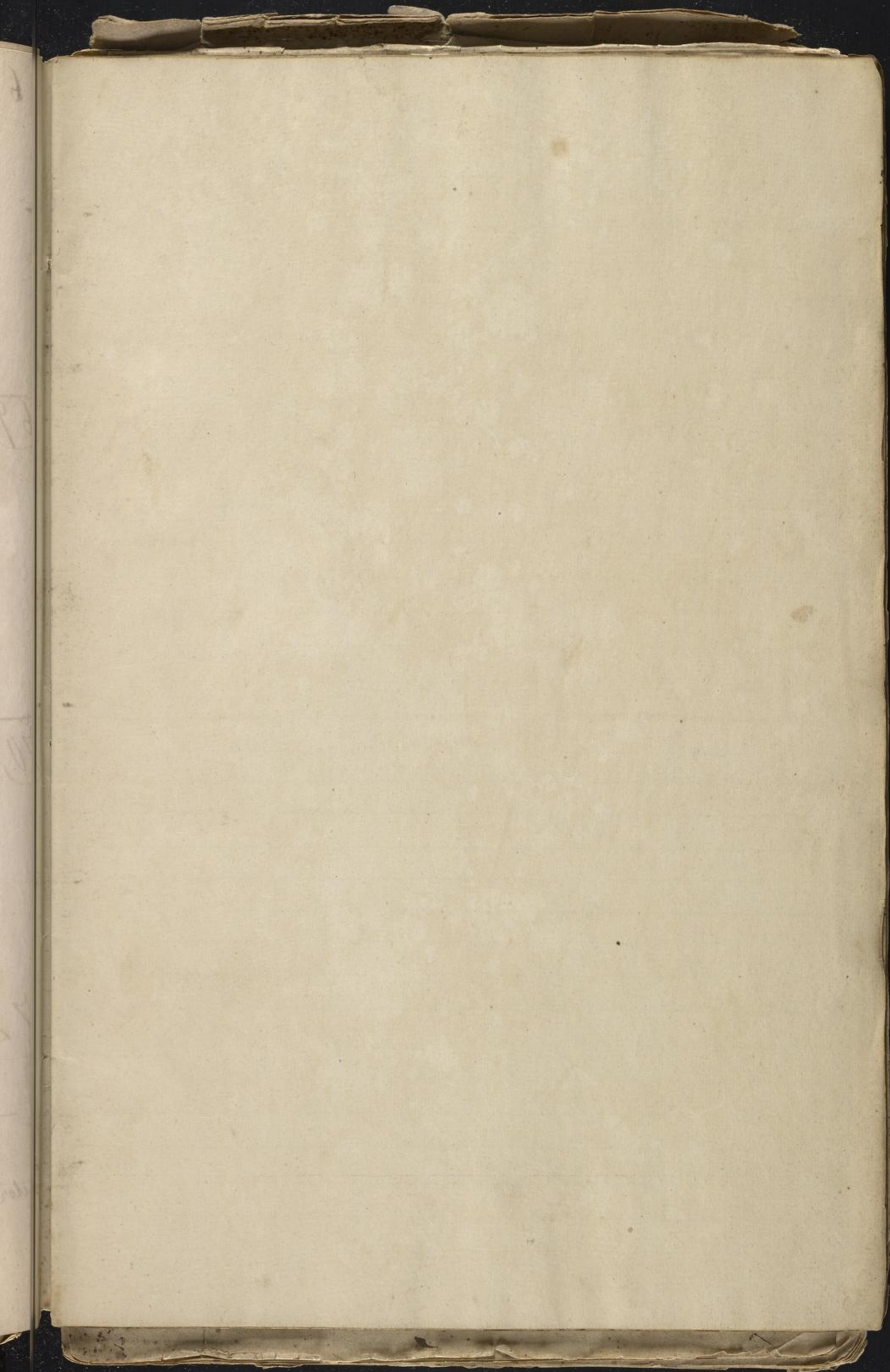
$$\frac{1}{2} \cdot \frac{1}{2} = \frac{1}{4}$$
$$\frac{1}{2} \cdot \frac{1}{2} = \frac{1}{4}$$
$$\frac{1}{2} \cdot \frac{1}{2} = \frac{1}{4}$$

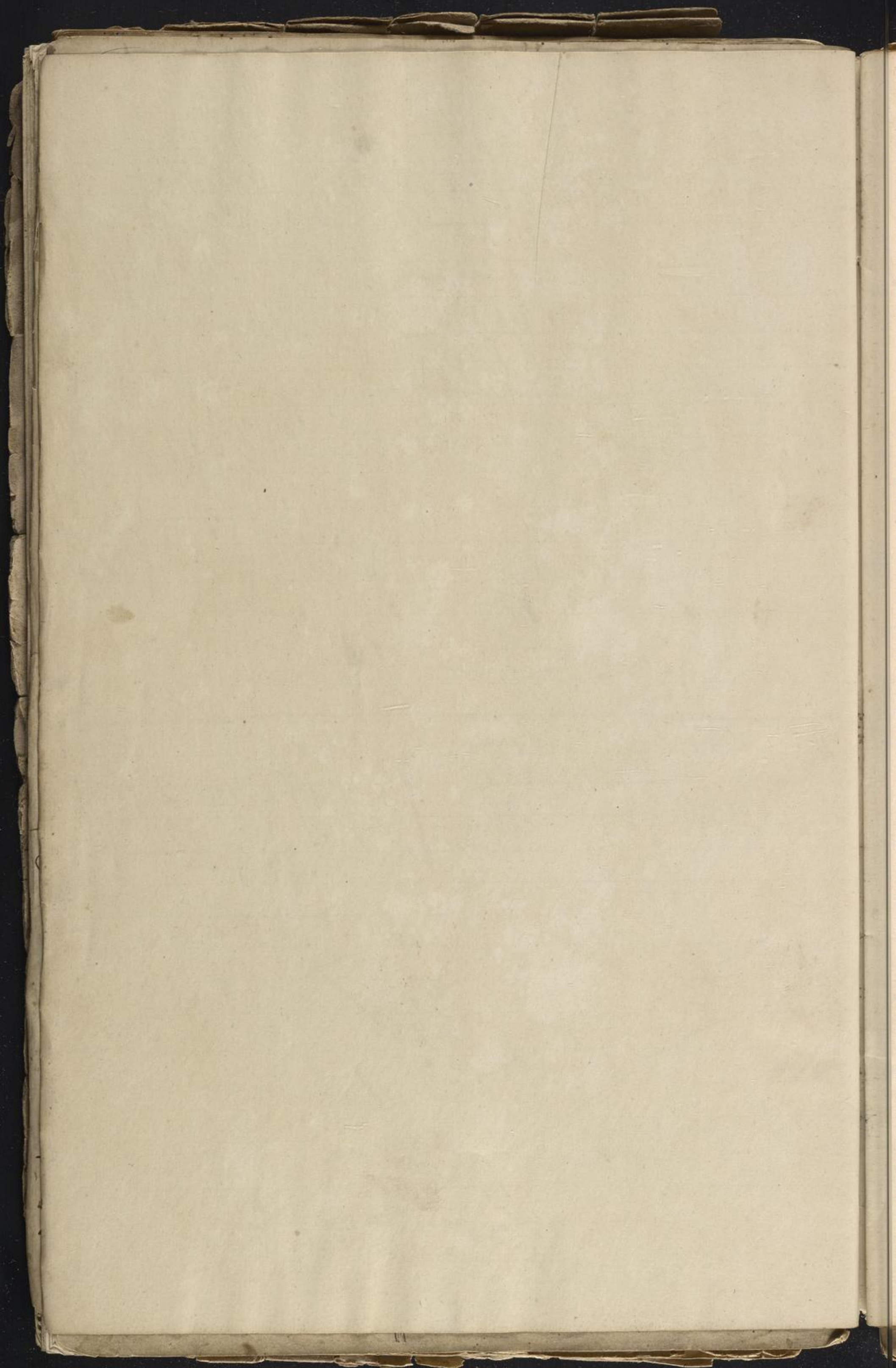
Middle section:

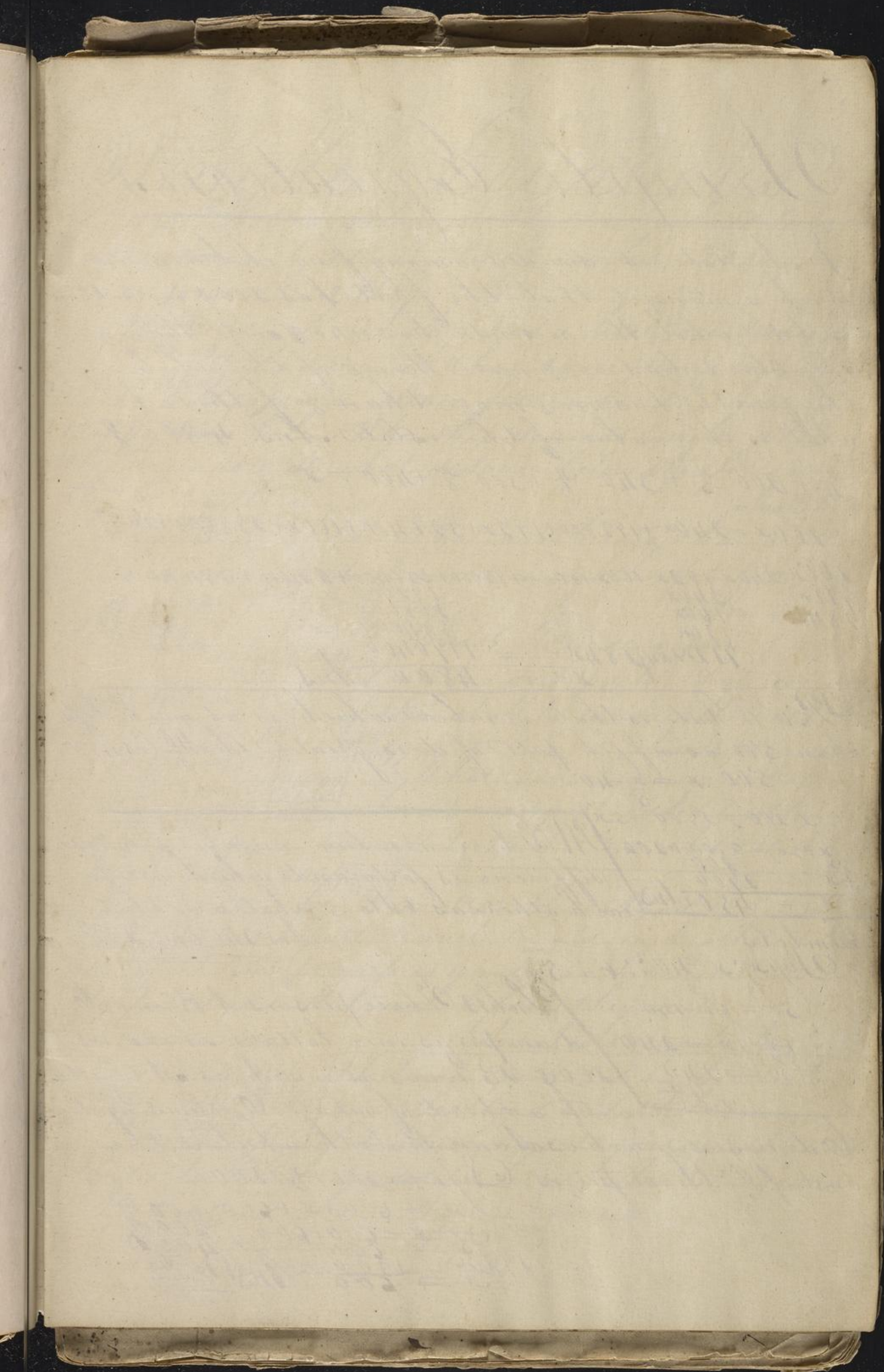
$$\frac{1}{2} \cdot \frac{1}{2} = \frac{1}{4}$$
$$\frac{1}{2} \cdot \frac{1}{2} = \frac{1}{4}$$
$$\frac{1}{2} \cdot \frac{1}{2} = \frac{1}{4}$$

Bottom section:

$$\frac{1}{2} \cdot \frac{1}{2} = \frac{1}{4}$$
$$\frac{1}{2} \cdot \frac{1}{2} = \frac{1}{4}$$
$$\frac{1}{2} \cdot \frac{1}{2} = \frac{1}{4}$$







Simple Equations

9. An estate is divided among four children in such a manner that the first has 200 \$ more than $\frac{1}{4}$ of the whole the second has 340 \$ more than $\frac{1}{5}$ of the whole the third has 300 \$ more than $\frac{1}{6}$ of the whole the fourth has 400 \$ more than $\frac{1}{8}$ of the whole what is the value of the estate. Ans. 4800 \$

$$\frac{x}{4} + 200 \quad \frac{x}{5} + 340 \quad \frac{x}{6} + 300 \quad \frac{x}{8} + 400 = x$$

384000

$$960x = 240x + 192000 + 192x + 326400 + 160x + 288000 + 120x + 384000$$

$$960x - 240x - 192x - 160x - 120x = 192000 + 326400 + 288000 + 384000$$

$$\begin{array}{r} 112x \\ 284x \\ \hline \end{array}$$

$$\begin{array}{r} 240x \\ 160x \\ 120x \\ \hline \end{array}$$

$$\begin{array}{r} 192000 \\ 326400 \\ 288000 \\ 384000 \\ \hline \end{array}$$

$$112284284x = 1190400$$

$$x = 4800 \text{ Ans}$$

Prob 10 What is that number which is as much less than 500 as a fifth part of it is greater than 40. Ans 450

$$500 - x = \frac{x}{5} - 40$$

$$x - 200 = 2500 - 5x$$

$$x + 5x = 2500 + 200$$

$$\begin{array}{r} 5x \\ 6x \\ \hline \end{array}$$

$$\begin{array}{r} 200 \\ 2700 \\ \hline \end{array}$$

$$x = 450 \text{ Ans}$$

numbers

$$\text{Sup } x : x - 40 :: 6 : 5$$

$$5x = 6x - 240$$

$$6x - 5x = 240$$

$$x = 240$$

$$\begin{array}{r} 240 \\ 240 \\ \hline \end{array}$$

Prob 11 There are two numbers whose difference is forty and which are to each other as 6 to 5 what are the numbers. Ans 240 and 200

Prob 12 Three persons A B and C draw prizes in a lottery. A draws 200 \$ B draws as much as A together with a third of what C draws and C draws as much as A and B both what is the amt of the three prizes. Sup $x = 200 + 3 + 200$

$$3x = 600 + x + 600$$

$$3x - x = 600 + 600$$

$$\begin{array}{r} 2x \\ 1200 \\ \hline \end{array}$$

$$x = 600 \text{ Ans}$$

$$600$$

$$200$$

$$400$$

$$1200$$

Simple Equations

Prob 13 What number is that which is to 12 increased by 3 times the number as 2 to 9

$$x : 12 + 3x :: 2 : 9 \quad 14$$

$$9x = 24 + 6x$$

$$9x - 6x = 24$$

$$3x = 24$$

$$x = 8$$

A ship and a boat are descending a river at the same time the ship passes a certain fort when the boat is 13 miles down below. The ship descends 5 miles while the boat descends 3 at what distance below the fort will they be together

Ans 32 1/2 m

$$x : x - 13 :: 5 : 3$$

$$5x - 65 = 3x$$

$$5x - 3x = 65$$

$$2x = 65$$

$$x = 32 1/2$$

What number is that a sixth part of exceed an eighth of it by 20

$$\frac{x}{6} - \frac{x}{8} = 20$$

$$8x - 6x = 960$$

$$2x = 960$$

$$x = 480$$

Ans 480

$$9x : 200 - x :: 9 : 7$$

$$7x = 18000 - 9x$$

$$7x + 9x = 18000$$

$$16x = 18000$$

$$x = 1125$$

Prob 16 Divide a prize of 2000 \$ into two such parts that one shall of them shall be to the other as 9:7

Ans the parts are 1125 and 875

Prob 17

What sum of money is that whose 1/3 and 1/4 part added together amount to 94 \$

Ans 120 \$

$$\frac{x}{3} + \frac{x}{4} = 94$$

$$4x + 3x = 1128$$

$$7x = 1128$$

$$x = 161 1/7$$

Two travellers A and B 360 miles apart travel toward each other till they meet. A's progress is 10 miles an hour and B's 8 how far does each travel before they meet

Ans A goes 200 miles B 160

$$x : 360 - x :: 10 : 8$$

$$8x = 3600 - 10x$$

$$8x + 10x = 3600$$

$$18x = 3600$$

$$x = 200$$

19 A man spent 1/5 of his life in England 1/4 in Scotland and the remainder of it which was 20 years in the united States to What age did he live

Ans 48 years

$$\frac{x}{5} + \frac{x}{4} + 20 = x$$

$$4x + 5x + 400 = 20x$$

$$12x = 400 + 240$$

$$12x = 640$$

$$x = 53 1/3$$

$$12x - 4x - 5x = 240$$

$$3x = 240$$

$$x = 80$$

Simple Equations By W.

Prob. 20 What number is that $\frac{1}{4}$ of which is greater than $\frac{3}{5}$ of it by 96 Ans 1920

$$\frac{x}{4} - \frac{3x}{5} = 96$$

$$5x - 4x = 1920$$

$$x = 1920$$

21

A post is $\frac{1}{3}$ in the earth $\frac{2}{3}$ in the water and 15 ft above the water what is the length of the post Ans 55 ft

$$\frac{x}{3} + \frac{2x}{3} + 15 = x$$

$$4x + 15x + 455 = 35x$$

$$35x = 4x + 15x + 455$$

$$35x - 4x - 15x = 455$$

$$16x = 455$$

$$x = 35$$

22

What number is that to which 10 being added $\frac{3}{5}$ of the sum will be 66 Ans 100

$$x + 10 \times \frac{3}{5} = \frac{3x + 30}{5} = 66$$

$$3x + 30 = 330$$

$$3x = 330 + 30$$

$$3x = 360$$

$$x = 120$$

$$100$$

$$110$$

$$119$$

$$1330$$

$$66$$

Proof

$$\frac{3x}{4} + \frac{x}{10} + \frac{x}{8} + 20 = x$$

$$240x + 32x + 40x + 6400 = 320x$$

$$320x - 240x - 32x - 40x = 6400$$

$$312x$$

$$818x = 6400$$

$$x = 800$$

23

Of the trees of an orchard $\frac{3}{4}$ are apple trees to pear trees and the remainder peach trees which are 20 more than $\frac{1}{5}$ of the whole what is the whole number of the orchard Ans 800

$$240x + 32x + 40x + 6400 = 320x$$

$$320x - 240x - 32x - 40x = 6400$$

$$312x$$

$$818x = 6400$$

$$x = 800$$

24

A gentleman bought several galls of wine for 94 \$ and after using 7 galls himself sold $\frac{1}{4}$ of the remainder for 20 \$ how many galls had he at first Ans 47

$$94 : x :: 20 : \frac{x}{4}$$

$$\frac{94x - 658}{4} = 20x$$

$$94x - 658 = 80x$$

$$94x - 80x = 658$$

$$14x = 658$$

$$x = 47$$

25

A and B have the same income A contracts an annual debt amounting to $\frac{1}{4}$ of it B lives upon $\frac{3}{4}$ of it at the end of ten year B lends to A enough to pay off his debts and has 160 \$ to spare what is the income of each

Sup x income

$$\frac{x \times 10}{4} = \frac{10x}{4} \text{ As debt}$$

$$\frac{x \times 10}{5} = \frac{10x}{5} = 2x \text{ B money}$$

$$2x - \frac{10x}{4} = 160 \text{ Ans 280 \$}$$

$$14x - 10x = 1120$$

$$4x = 1120$$

$$x = 280$$

Continued By W^m H. McCormick
 Prob 26 A gentleman lived single $\frac{1}{4}$ of his whole life and after having been married 5 years more than $\frac{1}{4}$ of his life he had a son who died 4 year before him and who reached $\frac{1}{2}$ the age of his father to what age did the father live Ans 84

Sup^x the age of the father
 $\frac{x}{4} + \frac{x}{4} + 5 + \frac{x}{2} + 4 = x$
 $56x = 14x + 8x + 280 + 28x + 224$
 $56x - 14x - 8x - 28x = 280 + 224$
 $6 \overline{) 16x = 504}$
 $x = 84$

27 What number is that of which if $\frac{1}{3}$ and $\frac{1}{4}$ be added together the sum will be 73 Ans 84

Sup^x
 $\frac{x}{3} + \frac{x}{4} + 73 = x$
 $28x + 21x + 24x = 6132$
 $73 \overline{) 6132}$
 $x = 84$

28 A person after spending 100 \$ more than $\frac{1}{5}$ of his income had remaining 35 \$ more than $\frac{1}{2}$ of it Required his income A 450 \$

Sup^x the income
 $\frac{x}{5} + 100 = \frac{x}{2} + 35$
 $10x - 2x - 100 = 5x + 350$
 $10x - 2x - 5x = 350 + 1000$
 $3x = 1350$
 $x = 450$ Ans

Prob 29 In the composition of a quantity of gunnpowder the nitre was 10 lbs more than $\frac{1}{3}$ of the whole the sulphur $4\frac{1}{2}$ lbs less than $\frac{1}{6}$ of the whole the charcoal 2 lbs less than $\frac{1}{4}$ of the nitre What was the amount of the gunnpowder Ans 69

Sup^x the whole composition Now $\frac{x}{3} + 10 + \frac{x}{6} - \frac{9}{8} + \frac{x}{21} - 2 = x$
 $\frac{x}{3} + 10$ nitre
 $\frac{x}{6} - \frac{9}{8}$ Sulphur
 $\frac{2x}{21} - 2$ charcoal
 $504x + 7560 + 126x - 3402 + 72x + 1080 - 1512 = 756x$
 $756x = 504x + 7560 + 126x - 3402 + 72x + 1080 - 1512$
 $756x - 504x - 126x - 72x = 7560 - 3402 + 1080 - 1512$
 $54x = 3726$
 $x = 69$ Ans

Continued By W. H. M.
 Prob 30

A cask which held 146 gallons was filled with a mixture of brandy wine and water there were 15 galls of wine more than of brandy and as much water as the brandy and wine together What quantity was there of each

Sup^{se} the brandy $4x = 146 - 30$
 wine $x + 15$
 water $2x + 15$
 $4x + x + 15 + 2x + 15 = 146$
 $7x + 30 = 146$

$4x = 116$
 $x = 29$
 B
 44 W
 83

146 Proof

31 Four persons purchased a farm in company for 4755 \$ of which B paid three times as much as A C paid as much as A and B and D paid as much as C and B What did each pay

Sup^{se} What A pays
 $x + 3x + 4x + 7x = 4755$
 $15x = 4755$
 $x = 317$ As

Ans 317 951 1268 2219

317 As
 951 B
 1268 C
 2219 D
 4755 Proof

32 It is required to divide the number 99 into 5 such parts that the first may exceed the second by 3 be less than the third by 10 greater than the fourth by 9 and less than the 5 by 16 Ans 17

Let $x =$ the first part
 Then $x - 3 =$ the second
 $x + 10 =$ the third
 $x - 9 =$ the fourth
 $x + 16 =$ the fifth

$x + x - 3 + x + 10 + x - 9 + x + 16 = 99$
 $5x + 3 = 99$
 $5x = 96$
 $x = 19.2$

$5x = 96$
 $x = 19.2$ Answer

33

Divided a small

A father, a sum among 4 sons the third had 9 Shillings more than the fourth the second had 12 Shillings more than the third the first had 18 Shilling more than the second and the whole sum was 6 Shilling more than 7 times the sum the youngest received

Supp^x the youngest's share

Ans 153

$$x + x + 9 + x + 21 + x + 39 = 7x + 6$$

$$7x + 6 = x + x + 9 + x + 21 + x + 39$$

$$7x - x - x - x - x = 9 + 21 + 39 - 6$$

$$\frac{42x}{3x}$$

$$\frac{42x}{3x} = \frac{63}{x} = 21$$

21

147

153 Ans

34

A farmer had two flocks of sheep each containing the same number Having sold from one of these 39 and from the other 93 he finds twice as many remaining in the one as the other How many did each flock originally contain

Supp^x the number of sheep

$$2x - 186 = x - 39$$

$$x - 39 = x - 93$$

$$2x - x = 39 + 186$$

$$x - 39 = 2x - 186$$

$$\frac{x}{x} = \frac{39}{147}$$

Answer

35 An express travelling at the rate of 60 miles a day had been dispatched 5 days when a second was sent after him travelling at the rate of 75 miles a day In what time will the one overtake the other

$$\text{When } x : 60^m \times 5 : : 1 : \frac{75^m - 60}{15} \quad 15 \mid 15x = 300 \quad \text{Ans } 20$$

$$\frac{300}{15}$$

$$\frac{300}{15} = 20$$

36

The age of A is double that of B the age of B triple that of C and the sum of all their ages 140 What is the age of each

Supp^x C's age

$$x + 3x + 6x = 140$$

$$10 \mid 140 = 14$$

$$14 \text{ Cs}$$

$$14 \text{ Bs}$$

$$42 \text{ Bs}$$

$$42 \text{ Bs}$$

$$84 \text{ Cs}$$

$$84 \text{ As}$$

Proof

Simple Equations by Mr. Prob 37

Two pieces of cloth of the same price by the yd but of different lengths were bought the one for 5 lbs the other for 6½ if 10 be added to the length of each the sums will be as 5 to 6 required the length of each piece

Ans 20 & 26½

Sup x the shorter one

5 : x :: 6½ : 2x

$$\frac{5}{2}x = \frac{13x}{2} \times \frac{1}{5} = \frac{13x}{10} \text{ the longer}$$

$$x+10 : \frac{13x}{10}+10 :: 5 : 6$$

$$6x+60 = \frac{65x}{10} + 50$$

$$60x+600 = 65x+500$$

$$65x+500 = 60x+600$$

$$65x-60x = 600-500$$

$$\frac{5x}{5} = \frac{100}{5}$$

$$x = 20 \text{ the shorter}$$

if 5 : 20 :: 6½ : 26½

$$\frac{5}{20} = \frac{6.5}{26.5}$$

$$\frac{5}{20} = \frac{13}{53}$$

$$\frac{5}{20} = \frac{13}{53}$$

$$\frac{5}{20} = \frac{13}{53}$$

$$\frac{5}{20} = \frac{13}{53}$$

$$\frac{5}{20} = \frac{13}{53}$$

$$\frac{5}{20} = \frac{13}{53}$$

$$\frac{5}{20} = \frac{13}{53}$$

$$\frac{5}{20} = \frac{13}{53}$$

$$\frac{5}{20} = \frac{13}{53}$$

$$\frac{5}{20} = \frac{13}{53}$$

$$\frac{5}{20} = \frac{13}{53}$$

$$\frac{5}{20} = \frac{13}{53}$$

$$\frac{5}{20} = \frac{13}{53}$$

$$\frac{5}{20} = \frac{13}{53}$$

$$\frac{5}{20} = \frac{13}{53}$$

$$\frac{5}{20} = \frac{13}{53}$$

$$\frac{5}{20} = \frac{13}{53}$$

$$\frac{5}{20} = \frac{13}{53}$$

$$\frac{5}{20} = \frac{13}{53}$$

$$\frac{5}{20} = \frac{13}{53}$$

$$\frac{5}{20} = \frac{13}{53}$$

$$\frac{5}{20} = \frac{13}{53}$$

$$\frac{5}{20} = \frac{13}{53}$$

$$\frac{5}{20} = \frac{13}{53}$$

$$\frac{5}{20} = \frac{13}{53}$$

$$\frac{5}{20} = \frac{13}{53}$$

$$\frac{5}{20} = \frac{13}{53}$$

$$\frac{5}{20} = \frac{13}{53}$$

$$\frac{5}{20} = \frac{13}{53}$$

38 And and B began trade with equal sums of money the first year A gained 40 lbs and B lost 40 the second year A lost ⅓ of what he had at the end of the first and B gained 40 lbs less than twice the sum which A lost B had then twice as much money as A What sum did each begin with

Sup x the whole sum

$$x+40$$

$$x-40$$

Ans 320 lbs

$$x+40 - \frac{x+40}{3} \text{ A's sum}$$

$$\text{then } 2x+80 - \frac{2x+80}{3} = x-40 + \frac{2x+80}{3} - 40$$

$$18x+720-6x-240 = 9x-360+6x+240-360$$

$$18x-6x-9x-6x = -720+240-360+240-360$$

$$\frac{-6x}{-6x}$$

$$\frac{-6x}{-6x}$$

$$\frac{-6x}{-6x}$$

$$\frac{-6x}{-6x}$$

$$\frac{-6x}{-6x}$$

$$\frac{-6x}{-6x}$$

$$\frac{-6x}{-6x}$$

$$\frac{-6x}{-6x}$$

$$\frac{-6x}{-6x}$$

$$\frac{-6x}{-6x}$$

$$\frac{-6x}{-6x}$$

$$\frac{-6x}{-6x}$$

$$\frac{-360}{-360}$$

$$\frac{-360}{-360}$$

$$\frac{-360}{-360}$$

$$\frac{-360}{-360}$$

$$\frac{-360}{-360}$$

$$\frac{-360}{-360}$$

$$\frac{-360}{-360}$$

$$\frac{-360}{-360}$$

$$\frac{-360}{-360}$$

$$\frac{-360}{-360}$$

$$\frac{-360}{-360}$$

$$\frac{-360}{-360}$$

$$\frac{240}{240}$$

$$\frac{240}{240}$$

$$\frac{240}{240}$$

$$\frac{240}{240}$$

$$\frac{240}{240}$$

$$\frac{240}{240}$$

$$\frac{240}{240}$$

$$\frac{240}{240}$$

$$\frac{240}{240}$$

$$\frac{240}{240}$$

$$\frac{240}{240}$$

$$\frac{240}{240}$$

$$\frac{-1440}{-1440}$$

$$\frac{-1440}{-1440}$$

$$\frac{-1440}{-1440}$$

$$\frac{-1440}{-1440}$$

$$\frac{-1440}{-1440}$$

$$\frac{-1440}{-1440}$$

$$\frac{-1440}{-1440}$$

$$\frac{-1440}{-1440}$$

$$\frac{-1440}{-1440}$$

$$\frac{-1440}{-1440}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

$$\frac{-760}{-760}$$

39 What number is that which being severally added to 36 and 52 will make the former sum to the latter as 3 to 4

Ans 12

Sup $x + 36 : x + 52 :: 3 : 4$

$4x + 144 = 3x + 156$

$4x - 3x = 156 - 144$

$x = 12$ Ans

$12 + 36$

$48 - 144$

88

192

$12 + 52$

$36 + 156$

192

192 Proof

40 A gentleman bought a Chaise horse and harness for 360 \$ the horse cost twice as much as the harness and Chaise cost twice as much as the horse and harness together What was the price of each

Sup x the harness
 x horse
 $2x$ Chaise
 $x + 2x + 4x = 360$
 $7x = 360$
 $x = 40$ harness
 80 horse
 240 Chaise

40
 80
 240
 360 Proof

41 Out of a cask of wine from which had leaked $\frac{1}{3}$ part 21 galls were afterwards drawn When the cask was found to be half full how much did it hold

Sup x the content

Ans 126

$\frac{x}{3} + 21 = \frac{x}{2}$

$2x + 126 = 3x$

$3x - 2x = 126$

$x = 126$ content

3126

42

63

126 Proof

42 A man has 6 sons each of whom is 4 years older than his next younger brother and the eldest is three times the age as old as the youngest What is the age of each

$x + 20 = 3x$

10 the youngest

$x + 4 = 2x$

$3x = x + 4$

$3x - x = 4$

$2x = 4$

$x = 2$ the youngest

$x - 3x = -20$

$2x = -20$

$x = -10$

14 the second

18 the third

22 the fourth

26 the fifth

30 the sixth

Simple Equations by R

43 Divide the number 49 into two such parts that the greater increased by 6 shall be to the less diminished by 11 as 9 to 2

$$\begin{array}{l}
 x+6 : 49-x-11 :: 9 : 2 \\
 2x+12 = 441-9x-99 \\
 2x+9x = 441-99-12 \\
 11x = 330 \\
 x = 30
 \end{array}
 \quad
 \begin{array}{l}
 49 \text{ great } 19 \text{ less} \\
 30 \\
 19-11 \quad 30+6 \\
 8 : 36 : 9 : 2 \\
 72 = 72 \text{ Proof}
 \end{array}$$

44 What 2 numbers are as 2 to 3 to each of which if 4 be added the sums will be as 5 to 7

$$\begin{array}{l}
 \text{Sup } x \\
 2 : 3 :: x : 3x \\
 x+4 : 3x+4 :: 5 : 7 \\
 2x+8 : 3x+8 :: 10 : 14 \\
 28x+112 = 30x+80 \\
 30x+80 = 28x+112 \\
 30x-28x = 112-80 \\
 2x = 32 \\
 x = 16 \text{ less}
 \end{array}
 \quad
 \begin{array}{l}
 2 : 3 :: 16 \\
 2/48 \text{ larger} \\
 24 \\
 28 \\
 140 = 140 \text{ Proof}
 \end{array}$$

45 A person bought two casks of potters one of which held 5 times as much as the other from each of which he drew 4 galls and then found that there were 4 times as many galls remaining in the larger as in the other. How many were there in each

$$\begin{array}{l}
 x-4 \times 4 = 3x-4 \\
 4x-16 = 3x-4 \\
 4x-3x = -4+16 \\
 x = 12 \text{ the less}
 \end{array}
 \quad
 \begin{array}{l}
 12 \\
 36 \text{ longer} \\
 12-4 \times 4 = 36-4 \\
 32 = 32 \text{ Proof}
 \end{array}$$

46 Divide the number 68 into two such parts that the difference between the greater and 84 shall be equal to 3 times the difference between the less and 40

Ans 42 the greater 26 the less

Suppose the greater

68 - x the less

$$84 - x = 40 - 68 + x$$

$$84 - x = 120 - 204 + 3x$$

$$\frac{33x}{4} = 414x = 168$$

x = 112 the greater

$$\begin{array}{r} 68 \\ 42 \\ \hline 26 \text{ the less} \\ 40 \\ \hline 14 \\ 14 \\ \hline 28 \end{array}$$

Proof

47 Four places are situated in the order of the letters A B C D the distance from A to D is 34 miles the distance from A to B is to the distance from C to D as 2 to 3 and $\frac{1}{4}$ of the distance from A to B added to $\frac{1}{2}$ the distance from C to D is three times the distance from B to C What are the respective distances

Suppose from A to B 12 B to C 24 C to D 18

$$2:3::x \quad AB \quad BC \quad CD \quad 2:3::12$$

$$2:3::12$$

$$2136$$

$$18$$

$$4BC$$

$$\frac{x}{4} + \frac{3x}{4} = 2 \quad 6x + 2x + 9x = 204$$

$$\frac{x}{4} + \frac{3x}{4} = 2 \quad 11x = 204$$

$$x = 18 AB$$

$$34 \text{ Proof}$$

48 Divide the number 36 into 3 such parts that $\frac{1}{2}$ of the first $\frac{1}{3}$ of the second and $\frac{1}{4}$ of the third shall be equal to each other

A 8 12 16

Suppose the first number

$$x + \frac{3x}{2} + 2x = 36$$

$$\frac{x}{2} + \frac{3}{1} = \frac{3x}{2} \text{ the second}$$

$$2x + 3x + 4x = 72$$

$$\frac{x}{2} \times \frac{4}{1} = \frac{4x}{2} = 2x \text{ the third}$$

$$9x = 72$$

$$218$$

$$x = 8$$

$$4x = 12$$

$$16$$

Proof

Simple Equations by 49

A merchant supported himself 3 years for 50
 lbs a year and at the end of each year added
 to that part of his stock which was not thus
 expensed a sum equal to $\frac{1}{3}$ of this part at the
 end of the third year his original stock was
 doubled What was that stock Ans 740 lbs

Sup x the stock

$$x - 50 + \frac{x - 50}{3} \text{ the first year}$$

$$x - 100 + \frac{x - 50}{3} + \frac{x - 100}{3} + \frac{x - 50}{3} \text{ the second}$$

$$x - 150 + \frac{x - 50}{3} + \frac{x - 100}{3} + \frac{x - 50}{3} + \frac{x - 150}{3} + \frac{x - 50}{3} + \frac{x - 100}{3} + \frac{x - 50}{3} = 2x$$

$$x - 150 + \frac{3x - 300 + 3x - 200 + x - 50}{9} = 2x$$

$$x - 150 + \frac{7x - 550}{9} = 2x$$

$$x - 150 + \frac{7x - 550}{9} = 2x$$

$$27x - 4050 + 7x - 550 = 18x$$

$$54x = 27x - 4050 + 7x - 550$$

$$54x - 27x - 7x = -4050 - 550$$

$$\begin{array}{r} 54x \\ - 34x \\ \hline 20x \end{array} \quad \begin{array}{r} -4050 \\ - 550 \\ \hline -4600 \end{array}$$

$$10 \overline{) 200} \quad 740 \text{ Ans}$$

A general having lost a battle found that he had
 only $\frac{1}{2}$ of his army + 3600 men left fit for action $\frac{1}{8}$
 of the army + 600 men being wounded and the rest
 who were $\frac{1}{5}$ of the whole either slain taken prisoner
 or being ~~absent~~ missing of how many men did his
 army consist Sup x the army Ans 24000

$$\frac{x}{2} + 3600 \quad \frac{x}{8} + 600 \quad \frac{x}{5} = x$$

$$40x + 288000 + 10x + 48000 + 16x = 80x$$

$$80x = 40x + 288000 + 10x + 48000 + 16x$$

$$80x - 40x - 10x - 16x = 288000 + 48000$$

$$\begin{array}{r} 80x \\ - 40x \\ - 10x \\ - 16x \\ \hline 14x \end{array} \quad \begin{array}{r} 288000 \\ + 48000 \\ \hline 336000 \end{array}$$

$$14 \overline{) 336000} \quad x = 24000 \text{ Ans}$$

Powers Continued by 1/4

4 Reduce $\frac{2ay}{5a^3y - 12a^2y^2 + 6ay^3} = \frac{4a^2 - 6ay + 3y^2}{3a + 2y}$ Ans

6 Reduce $\frac{2a^4}{5a^5}$ and $\frac{a^2}{a^4}$ to a common denominator

$$\begin{array}{l} 2a^4 \times a^4 = 2a^8 \\ 5a^5 \times a^2 = 5a^7 \\ 5a^7 \times a^4 = 5a^7 \text{ com Denom} \end{array} \quad \frac{2a^8}{5a^7} \div \frac{5a^7}{5a^7} = \frac{2a^3}{5a^2} \text{ Ans}$$

8 Multiply $\frac{a^2+b}{b^4}$ into $\frac{a-b}{3}$

$$\frac{a^2+b}{b^4} \times \frac{a-b}{3} = \frac{a^3+ab-a^2b-b^2}{3b^4} \text{ Answer}$$

9 Multiply $\frac{a^5+1}{x^2}$ into $\frac{b^2-1}{x+a}$

$$\frac{x+a}{x^2} \times \frac{x^2}{x^2+a^2x^2}$$

$$\frac{a^5+1}{x^2} \times \frac{b^2-1}{x+a} = \frac{a^5b^2+b^2-a^5-a^5-1}{x^3+ax^2} \text{ Ans}$$

10 Multiply $\frac{b^4}{a^{-2}}$ into $\frac{h^{-3}}{x}$ and $\frac{a^n}{y^{-3}}$

$$\frac{b^4}{a^{-2}} \times \frac{h^{-3}}{x} \times \frac{a^n}{y^{-3}} \text{ Ans}$$

12 Divide $\frac{a^3x^4}{a^2}$ by $\frac{x^2-a^{-2}}{a}$

$$\frac{x^2 \cdot a^{-2}}{a^3x^2-1} \div \frac{a^3x^4}{a^4-ax^4} = \frac{a^3x^4}{a^4-ax^4} \text{ Ans}$$

13 Divide $\frac{b-y^{-1}}{y}$ by $\frac{a^3+b^{-4}}{y^3}$

$$\frac{b-y^{-1}}{y} \times \frac{y^3}{y^3} \div \frac{a^3+b^{-4}}{y^3}$$

$$\frac{a^3+b^{-4}}{a^3y+b^{-4}y}$$

$$\frac{b-y^{-1}}{y^3} \div \frac{a^3+b^{-4}}{y^3} = \frac{by^2-y}{a^3+b^{-4}} \text{ Ans}$$

14 Divide $\frac{h^3-1}{d^4}$ by $\frac{d^{n+1}+1}{h}$

$$\frac{h^3-1}{d^4} \times \frac{h}{d^{n+1}+1}$$

$$\frac{d^{n+1}+1}{d^{n+4}+d^4}$$

$$\frac{h^3-1}{d^{n+4}+d^4} \text{ Ans}$$

Radical Quantities

7 Reduce $a^{\frac{1}{3}}$ and $b^{\frac{1}{5}}$

$$\begin{array}{l} 1 \times 5 = 5 \\ 1 \times 3 = 3 \\ 3 \times 5 = 15 \end{array} = \sqrt[15]{a^5 b^3} \quad \text{Ans}$$

8 Reduce $x^{\frac{2}{3}}$ and $5^{\frac{1}{2}}$

$$\begin{array}{l} x^{\frac{2}{3}} \quad 5^{\frac{1}{2}} \\ 3 \times 1 = 3 \\ 2 \times 2 = 4 \\ 3 \times 2 = 6 \quad \text{len D} \\ 5^{\frac{3}{6}} \quad x^{\frac{4}{6}} \quad \text{Ans} \end{array}$$

6 Reduce $\sqrt[3]{64b^3c}$

A283 Multiply $5\sqrt{5}$ into $3\sqrt{8}$ Ans $30\sqrt{10}$

$$\begin{array}{r} 5\sqrt{5} \\ 3\sqrt{8} \\ \hline 15\sqrt{40} \end{array} \quad \begin{array}{l} \sqrt{4} \times \sqrt{10} \\ 15 \times 2 \times \sqrt{10} \\ 30\sqrt{10} \quad \text{Ans} \end{array}$$

3 Multiply $2\sqrt{3}$ into $3\sqrt{4}$

$$2\sqrt{3} \times 3\sqrt{4} = 3\sqrt{16}$$

$$\begin{array}{l} 2 \times 1 = 2 \\ 3 \times 1 = 3 \\ 3 \times 2 = 6 \quad \text{commoning} \end{array}$$

$$\begin{array}{r} 2\sqrt{27} \\ 3\sqrt{16} \\ \hline 6\sqrt{27} \\ 6\sqrt{27} \quad \text{Ans} \end{array}$$

4 Multiply \sqrt{d} into $3\sqrt{4}$

$$\begin{array}{l} 3 \times 1 = 3 \\ 2 \times 1 = 2 \\ 3 \times 2 = 6 \end{array}$$

$$\begin{array}{l} \sqrt{d} \\ \sqrt{4} \\ \hline \sqrt{4d} \quad \text{Answer} \end{array}$$

5 Multiply $\sqrt{\frac{2ab}{3c}}$ into $\sqrt{\frac{9ad}{2b}}$ Ans $\sqrt{\frac{3a^2d}{c}}$

$$\frac{\sqrt{2ab}}{\sqrt{3c}} \times \frac{\sqrt{9ad}}{\sqrt{2b}} = \frac{\sqrt{18a^2bd}}{\sqrt{6bc}}$$

$$6b \frac{\sqrt{18a^2bd}}{\sqrt{6bc}} = \frac{\sqrt{3a^2d}}{\sqrt{c}} \quad \text{Ans}$$

$$\frac{c-d \times \sqrt{ac}}{a \sqrt{a-x}} \quad (ac-ad) \quad (a^2x-ax^2)$$

7 Multiply $a(a-x)^{\frac{1}{2}}$ into $(c-d) \times (ax)^{\frac{1}{2}}$

ANSWER

W G McCormick

Division of Radical quantities

Divide $ab(x^2b)^{\frac{1}{4}}$ by $(x)^{\frac{1}{2}}$

$$\begin{array}{r} \frac{1}{2} \quad \frac{1}{4} \\ 2 \times 1 = 2 \\ 4 \times 1 = 4 \\ 2 \times 4 = 8 \text{ com} \end{array} \quad \begin{array}{r} \frac{2}{8} \quad \frac{4}{8} \\ \frac{1}{4} \quad \frac{1}{2} \end{array}$$

$$\frac{ab(x^2b)^{\frac{1}{4}}}{a(x^2)^{\frac{1}{4}}} = \sqrt[4]{b^5} \text{ Ans}$$

1 Divide $2\sqrt[3]{bc}$ by $3\sqrt{ac}$

$$\begin{array}{r} \frac{1}{3} \quad \frac{1}{2} \\ 3 \times 1 = 3 \\ 2 \times 1 = 2 \\ 3 \times 2 = 6 \text{ com D} \end{array}$$

$$\frac{2\sqrt[6]{b^2c^2}}{3\sqrt[6]{a^3c^3}} = \frac{2}{3}\sqrt[6]{\frac{b^2c^2}{a^3c^3}} \text{ Ans}$$

2 Divide $10\sqrt[3]{108}$ by $5\sqrt[3]{4}$

$$\frac{10\sqrt[3]{108}}{5\sqrt[3]{4}} = \frac{2\sqrt[3]{27}}{\sqrt[3]{1}} = 2 \text{ Ans}$$

3 Divide $10\sqrt{27}$ by $2\sqrt{3}$

$$\frac{10\sqrt{27}}{2\sqrt{3}} = \frac{5\sqrt{9}}{\sqrt{1}} = 15 \text{ Ans}$$

4 Divide $8\sqrt{108}$ by $2\sqrt{6}$

$$\frac{8\sqrt{108}}{2\sqrt{6}} = \frac{4\sqrt{18}}{\sqrt{1}} = 12\sqrt{2} \text{ Ans}$$

$$\sqrt{9} \times \sqrt{2} = 3\sqrt{2}$$

5 Divide $(a^2b^2d^3)^{\frac{1}{6}}$ by $d^{\frac{1}{2}}$

$$\begin{array}{r} \frac{1}{6} \quad \frac{1}{2} \\ 6 \times 1 = 6 \\ 2 \times 1 = 2 \\ 2 \times 6 = 12 \text{ com D} \end{array}$$

$$\frac{(a^2b^2d^3)^{\frac{1}{6}}}{(d^6)^{\frac{1}{12}}} = (ab)^{\frac{1}{3}} \text{ Ans}$$

6 Divide $(16a^3 - 12a^2x)^{\frac{1}{2}}$ by $2a$

$$\frac{(16a^3 - 12a^2x)^{\frac{1}{2}}}{2a} = \frac{2a(8a^2 - 6ax)^{\frac{1}{2}}}{2a} = (4a - 3x)^{\frac{1}{2}} \text{ Ans}$$

Involution & Radical

2 Required the cube ~~root~~ of $a - \sqrt{b}$

$$\begin{array}{r} a - \sqrt{b} \\ a^3 - a^2\sqrt{b} \\ -a^2\sqrt{b} + b \\ a^3 - 2a^2\sqrt{b} + b \\ a - \sqrt{b} \\ -a^2\sqrt{b} + 2ab - b\sqrt{b} + a^3 - 2a^2\sqrt{b} + ab \\ -2a^2\sqrt{b} + ab \\ 2a^4\sqrt{b} + 3ab - b\sqrt{b} + a^3 \text{ (Answer)} \end{array}$$

3 Required the cube of $2d + \sqrt{x}$

$$\begin{array}{r} 2d + \sqrt{x} \\ 4d + 2d\sqrt{x} \\ 2d\sqrt{x} + x \\ 4d + 4d\sqrt{x} + x \\ 2d + \sqrt{x} \\ 4d\sqrt{x} + dx + x\sqrt{x} + 8d^2 + 8ad\sqrt{x} + 2dx \\ 4d\sqrt{x} + 6dx + x\sqrt{x} + 8d^2 + 8ad\sqrt{x} \text{ (Ans)} \end{array}$$

4 13 d 7 The fractions $\frac{6}{5^{\frac{1}{4}}} = \frac{6 \times 5^{\frac{3}{4}}}{5^{\frac{1}{4} + \frac{3}{4}}} = \frac{6}{5} \sqrt[4]{5^3} \text{ (Ans)}$

8 The Fractions $\frac{8}{\sqrt{3} + \sqrt{2} + 1} = \frac{8(\sqrt{3} - \sqrt{2} - 1)(-\sqrt{2})}{(\sqrt{3} + \sqrt{2} + 1)(\sqrt{3} - \sqrt{2} - 1)(-\sqrt{2})}$

$$\begin{array}{r} \sqrt{3} + \sqrt{2} + 1 \\ \sqrt{3} + \sqrt{2} - 1 \\ -\sqrt{3} - \sqrt{2} - 1 \\ \sqrt{6} - \sqrt{2} - 2 \\ \sqrt{3} \\ 3 + \sqrt{6} \\ 3 - 2\sqrt{2} - 8 \\ -\sqrt{2} \\ 2\sqrt{4} = -4 \end{array}$$

$$\begin{array}{r} \sqrt{3} - \sqrt{2} - 1 \\ 8\sqrt{3} - 8\sqrt{2} - 8 \\ -\sqrt{2} \\ 4(8\sqrt{6} + 8\sqrt{4} + 8\sqrt{2}) \\ = 2\sqrt{6} + 2\sqrt{4} + 2\sqrt{2} = 4 - 2\sqrt{6} + 2\sqrt{2} \\ 2\sqrt{4} = 4 \end{array} \text{ (Ans)}$$

9 Reduce $\frac{2}{\sqrt{3}}$ to a fraction having a Rational Denominator

$$\begin{array}{r} \frac{2}{\sqrt{3}} \quad \frac{2 \times \sqrt{3}}{\sqrt{3} - \sqrt{3}} \quad \sqrt{3} \\ \frac{2\sqrt{3}}{0} \quad 2\sqrt{3} = 3 \\ 3 \text{ (Answer)} \end{array}$$

10 Reduce $\frac{a-\sqrt{b}}{a+\sqrt{b}}$ to a fraction having a rational Denominator

$$\frac{a-\sqrt{b}}{a+\sqrt{b}} = \frac{a-\sqrt{b}}{a+\sqrt{b}} \times \frac{a-\sqrt{b}}{a-\sqrt{b}} = \frac{a^2 - \sqrt{b}a - a\sqrt{b} + b}{a^2 - b}$$

Ans $\frac{a^2 - 2a\sqrt{b} + b}{a^2 - b}$

Examples for Practice

Find the 4th root of $81a^2$

Ans $3\sqrt[4]{a}$ 4th root

2 Find the 6th root of $(a+b)^{-\frac{1}{2}}$

Ans $(a+b)^{-\frac{1}{12}}$ answer

3 Find the n^{th} root of $(x-y)^{\frac{1}{t}}$

Ans $(x-y)^{\frac{1}{tn}}$

4 Find the cube root of $-125ax^6$

Ans $-5x^2\sqrt[3]{a}$

5 Find the square root of $\sqrt[3]{\frac{4a^4}{9x^2y^2}}$

Ans $\sqrt{\frac{2a^2}{3xy}}$

6 Find the square root of $\frac{32a^5x^{10}}{243}$

Ans $\frac{2a^{\frac{5}{2}}x^5}{\sqrt{243}}$

7 Find the square root of $x^2 - 6bx + 9b^2$

Ans $x - 3b$

8 Find the square root of $a^2 + ay + \frac{y^2}{4}$

Ans $a + \frac{y}{2}$

Radical Quantities by

Reduce asc^2 to the form of the 6th root
 $\sqrt[6]{dx^{12}}$ Ans

10 Reduce $-3y$ to the form of the cube root $\sqrt[3]{-27y^3}$ Ans

11 Reduce a^2 and $a^{\frac{1}{3}}$ to a common index
 a^2 $a^{\frac{1}{3}}$ $(a^6)^{\frac{1}{3}}$ $(a)^{\frac{1}{3}}$ Ans $\frac{2}{1}$ $\frac{1}{3}$ $2 \times 3 = 6$
 $1 + 1 = 1$
 $1 + 3 = 3$ Com

12 Reduce $4^{\frac{1}{3}}$ and $5^{\frac{1}{4}}$ to a common index
 $\frac{1}{3}$ $\frac{1}{4}$ $1 \times 4 = 4$ $3 \times 1 = 3$ $3 \times 4 = 12$ Com index $\sqrt[12]{4^4}$ $\sqrt[12]{5^3}$ Ans

13 Reduce $a^{\frac{1}{2}}$ and $b^{\frac{1}{4}}$ to the common index 8
 $\frac{1}{8} \div \frac{1}{2} = \frac{8}{1} \times \frac{1}{2} = \frac{8}{2} = 4$ $\sqrt[8]{a^4}$ $\sqrt[8]{b^2}$ Ans
 $\frac{1}{8} \div \frac{1}{4} = \frac{8}{1} \times \frac{1}{4} = \frac{8}{4} = 2$

14 Reduce $2^{\frac{1}{2}}$ and $4^{\frac{1}{4}}$ to the common index 8
 $\frac{1}{8} \div \frac{1}{2} = \frac{8}{1} \times \frac{1}{2} = \frac{8}{2} = 4$ $\sqrt[8]{2^4}$ $\sqrt[8]{4^2}$ Ans
 $\frac{1}{8} \div \frac{1}{4} = \frac{8}{1} \times \frac{1}{4} = \frac{8}{4} = 2$

15 Remove a factor from $\sqrt{294}$ $\sqrt{49} \times \sqrt{6}$
 $\sqrt{49} \times \sqrt{6}$ Ans

16 Remove a factor from $\sqrt{x^3 - a^2x}$ $\sqrt{x^2} \times \sqrt{x - a^2}$
 $\times \sqrt{x - a^2}$ Ans

17 Remove a factor

Find the sum and difference of $\sqrt{4a^2x}$ and $\sqrt{a^2x}$
 $\sqrt{4a^2x}$ $4a\sqrt{x}$ $4a\sqrt{x}$ $\sqrt{a^2x}$ $a\sqrt{x}$
 $4a\sqrt{x}$ $2a\sqrt{x}$ Diff $6a\sqrt{x}$ Sum $2a\sqrt{x}$

18

Find the sum and Difference of $\sqrt[3]{192}$ and $\sqrt[3]{24}$
 $\sqrt[3]{192}$ $4\sqrt[3]{3}$ $4\sqrt[3]{3}$ $\sqrt[3]{24}$ $2\sqrt[3]{3}$
 $4\sqrt[3]{3}$ $6\sqrt[3]{3}$ Sum $2\sqrt[3]{3}$ Diff $2\sqrt[3]{3}$

Radical Quantities by W. G.

19 Multiply $\sqrt[3]{18}$ into $5\sqrt[3]{4}$ $\frac{4\sqrt[3]{18}}{5\sqrt[3]{4}} = \frac{4\sqrt[3]{18}}{5\sqrt[3]{2}}$ $\sqrt[3]{8}\sqrt[3]{9} = 2\sqrt[3]{9}$
 $35 \times 2\sqrt[3]{9} = 70\sqrt[3]{9}$ Ans

20 Multiply $4+2\sqrt{2}$ into $2-\sqrt{2}$ $\frac{4+2\sqrt{2}}{2-\sqrt{2}}$ $(2\sqrt{4}=4)$
 $\frac{4+2\sqrt{2}}{2-\sqrt{2}} \times \frac{2+\sqrt{2}}{2+\sqrt{2}} = \frac{8+4\sqrt{2}+4+2\sqrt{2}}{4-2} = \frac{12+6\sqrt{2}}{2} = 6+3\sqrt{2}$ Ans

21 Multiply $a(a+\sqrt{c})^{\frac{1}{2}}$ into $b(a-\sqrt{c})^{\frac{1}{2}}$ $\frac{a\sqrt{a+\sqrt{c}}}{b\sqrt{a-\sqrt{c}}}$
 $\frac{a\sqrt{a+\sqrt{c}}}{b\sqrt{a-\sqrt{c}}} \times \frac{\sqrt{a-\sqrt{c}}}{\sqrt{a-\sqrt{c}}} = \frac{a\sqrt{a^2-c}}{b\sqrt{a^2-c}} = \frac{a}{b}$ Ans

22 Multiply $2(a+b)^{\frac{1}{n}}$ into $3(a+b)^{\frac{1}{m}}$ $\frac{2(a+b)^{\frac{1}{n}}}{3(a+b)^{\frac{1}{m}}}$
 $\frac{2(a+b)^{\frac{1}{n}}}{3(a+b)^{\frac{1}{m}}} \times \frac{(a+b)^{\frac{1}{m}}}{(a+b)^{\frac{1}{m}}} = \frac{2(a+b)^{\frac{1}{n}+\frac{1}{m}}}{3(a+b)^{\frac{1}{m}}}$ Answer

23 Multiply Divide $6\sqrt{54}$ by $3\sqrt{2}$ $\frac{6\sqrt{54}}{3\sqrt{2}} = \frac{6\sqrt{54}}{3\sqrt{2}} = 2\sqrt{27}$
 $2 \times 3\sqrt{3} = 6\sqrt{3}$ Ans

24 Divide $4\sqrt[3]{72}$ by $2\sqrt[3]{18}$ $\frac{4\sqrt[3]{72}}{2\sqrt[3]{18}} = \frac{4\sqrt[3]{72}}{2\sqrt[3]{18}} = 2\sqrt[3]{4}$ Ans

25 Divide $\sqrt{4}$ by $\sqrt{2}$ $\frac{\sqrt{4}}{\sqrt{2}} = \frac{2}{\sqrt{2}} = \sqrt{2}$ Ans

26 Divide $8\sqrt[3]{512}$ by $4\sqrt[3]{2}$ $\frac{8\sqrt[3]{512}}{4\sqrt[3]{2}} = \frac{8\sqrt[3]{512}}{4\sqrt[3]{2}} = 2\sqrt[3]{256}$ Ans

27 Find the of $17\sqrt{21}$

28 Find the square of $5+\sqrt{2}$ $\frac{5+\sqrt{2}}{5+\sqrt{2}} \times \frac{5-\sqrt{2}}{5-\sqrt{2}} = \frac{25-5\sqrt{2}+5\sqrt{2}-2}{25-10\sqrt{2}+2} = \frac{23}{27+10\sqrt{2}}$ Ans

Radical Quantities by W^m

29 Find the 4th power of $\sqrt[4]{6}$

$$\begin{array}{r} \sqrt[4]{6} \\ \sqrt[4]{6} \\ \hline 36 \sqrt[4]{6^2} \\ \sqrt[4]{6} \\ \hline 216 \sqrt[4]{6^3} \\ \sqrt[4]{6} \\ \hline 1296 \sqrt[4]{6^4} \end{array}$$

$$1296 \sqrt[4]{6^4} = 1296 \times 36 = 46656 = 36^4 \text{ Answer}$$

30 Find the cube of $\sqrt{x} - \sqrt{b}$

$$\begin{array}{r} \sqrt{x} - \sqrt{b} \\ \sqrt{x} - \sqrt{b} \\ \hline x - \sqrt{bx} - \sqrt{bx} + b \\ x - 2\sqrt{bx} + b \\ \sqrt{x} - \sqrt{b} \\ \hline x\sqrt{x} - 2\sqrt{bx} - b\sqrt{x} + \sqrt{bx} + x\sqrt{b} - \sqrt{b}^3 \\ x\sqrt{x} - \sqrt{bx} - b\sqrt{x} + x\sqrt{b} - \sqrt{b}^3 \end{array} \text{ Ans}$$

31 Find a factor which will make $\sqrt[3]{y}$ rational
 $\sqrt[3]{y} \times \sqrt[3]{y^2} = \sqrt[3]{y^3} = y \text{ Answer}$

32 Find a factor which will make $\sqrt{5} - \sqrt{x}$ rational
 $\sqrt{5} - \sqrt{x} \times \sqrt{5} + \sqrt{x}$

$$\begin{array}{r} \sqrt{5} - \sqrt{x} \\ \sqrt{5} + \sqrt{x} \\ \hline 5 - \sqrt{5x} - \sqrt{5x} + x \\ 5 - 2\sqrt{5x} + x \end{array} \text{ Rational } 5 - 2\sqrt{5x} + x \text{ Answer}$$

33 Reduce $\frac{\sqrt{a}}{\sqrt{x}}$ to a fraction having a rational num^{er}

$$\frac{\sqrt{a}}{\sqrt{x}} = \frac{\sqrt{a} \times \sqrt{a}}{\sqrt{x} \times \sqrt{a}} = \frac{a}{\sqrt{ax}} \text{ Answer}$$

34 Reduce $\frac{\sqrt{6}}{\sqrt{7} \times \sqrt{3}}$ to a fraction having a rational Denominator

$$\frac{\sqrt{6}}{\sqrt{7} \times \sqrt{3}} = \frac{\sqrt{6} \times \sqrt{21}}{\sqrt{7} \times \sqrt{3} \times \sqrt{21}} = \frac{\sqrt{126}}{21} \text{ Ans}$$

Equations Reduction of by $\frac{1}{2}$

Prob 6

Reduce $3 + 2\sqrt{x} - \frac{4}{5} = 6$ $15 + 10\sqrt{x} - \frac{4}{5} = 30$

$$10\sqrt{x} = 30 - 15 + \frac{4}{5}$$

$$10\sqrt{x} = 19$$

$$100 \overline{) 100 \sqrt{x} \quad 19}$$

$$x = \frac{361}{100} \text{ Ans}$$

7 Reduce $4\sqrt{\frac{x}{5}} = 8$

$$4\sqrt{\frac{x}{5}} = 8$$

$$\frac{16\sqrt{16x}}{5} = 64$$

$$16 \overline{) 16x = 320} \text{ Ans}$$

$$x = 20$$

8 Reduce $(2x+3)^{\frac{1}{2}} + 4 = 7$

$$\sqrt{2x+3} = 7 - 4$$

$$\sqrt{2x+3} = 3$$

$$2x+3 = 27$$

$$2 \overline{) 2x = 24} = x = 12 \text{ Ans}$$

9 Reduce $\sqrt{12+x} = x^2 + \sqrt{x}$

$$12+x = x^2 + \sqrt{x}$$

$$\frac{2+\sqrt{x}}{2+\sqrt{x}}$$

$$\frac{2\sqrt{x}+x}{2\sqrt{x}+x}$$

$$12+x = \frac{4}{4} + \frac{4\sqrt{x}+x}{4}$$

$$4+4\sqrt{x}+x = 12+x$$

$$4\sqrt{x} = 12-4$$

$$4\sqrt{x} = 8$$

$$16 \overline{) 16\sqrt{x} = 64}$$

$$x = 4 \text{ Ans}$$

10 Reduce $\sqrt{x-a} = \sqrt{x} - \frac{1}{2}\sqrt{a}$

$$\frac{\sqrt{x-a}}{\sqrt{x-a}}$$

$$\frac{\sqrt{x-a}}{\sqrt{x-a}}$$

$$\frac{x-a}{x-a}$$

$$\frac{\sqrt{x} - \frac{1}{2}\sqrt{a}}{\sqrt{x} - \frac{1}{2}\sqrt{a}}$$

$$\frac{\sqrt{x} - \frac{1}{2}\sqrt{a}}{\sqrt{x} - \frac{1}{2}\sqrt{a}}$$

$$\frac{-\frac{1}{2}\sqrt{ax} + \frac{1}{4}a}{-\frac{1}{2}\sqrt{ax} + \frac{1}{4}a}$$

$$\frac{x - \frac{1}{2}\sqrt{ax}}{x - \frac{1}{2}\sqrt{ax} + \frac{1}{4}a}$$

$$Vax = a + \frac{a}{4}$$

Involving $ax = a^2 + \frac{a^2}{2} + \frac{a^2}{16}$

clearing of 32 $32ax = 32a^2 + 16a^2 + 2a^2$

$$32a \overline{) 32ax = 50a^2}$$

$$x = \frac{50a^2}{32a}$$

$$= \frac{25a}{16} \text{ Ans}$$

Reduction of Equations by W.D.

11 Reduce $\sqrt{5x} \times \sqrt{x+2} = 2 + \sqrt{5x}$

$$\frac{\sqrt{x+2}}{\sqrt{5}} \times \sqrt{5x+10} = \frac{2 + \sqrt{5x}}{1}$$

$$4 + 4\sqrt{5x} = 10$$

$$4\sqrt{5x} = 6$$

$$4\sqrt{5x}$$

$$16 \times 5x = 36$$

$$80 \mid 80x = 36$$

$$x = \frac{36}{80} = \frac{9}{20} \text{ Ans}$$

12 Reduce $\frac{x-ax}{\sqrt{x}} = \frac{\sqrt{x}}{x}$

$$\frac{x-ax}{1-a} \times \frac{x}{x^2-ax^2} = \frac{\sqrt{x}}{\sqrt{x}}$$

$$x = \frac{1}{1-a} \text{ Ans}$$

13 Reduce $\frac{\sqrt{x}+28}{\sqrt{x}+4} = \frac{\sqrt{x}+38}{\sqrt{x}+6}$

$$\frac{\sqrt{x}+28}{\sqrt{x}+4} \times \frac{\sqrt{x}+6}{\sqrt{x}+6} = \frac{\sqrt{x}+38}{\sqrt{x}+6} \times \frac{\sqrt{x}+4}{\sqrt{x}+4}$$

$$x + 34\sqrt{x} + 168 = x + 42\sqrt{x} + 152$$

$$42\sqrt{x} + 152 = 34\sqrt{x} + 168$$

$$42\sqrt{x} - 34\sqrt{x} = 168 - 152$$

$$8\sqrt{x} = 16$$

$$64 \mid 64x = 256 \text{ Answer}$$

$$x = 4$$

14 Reduce $\sqrt{x} + \sqrt{a+x} = \frac{2a}{\sqrt{a+x}}$

$$\sqrt{x} + \sqrt{a+x} \times \sqrt{a+x} + a + x = 2a \times \frac{a-x}{a-x}$$

$$\sqrt{ax+x^2} = \frac{a-x}{1}$$

$$a \mid ax+x^2 = \frac{a^2-2ax+x^2}{a^2-2ax+x^2}$$

$$x + 2x = a$$

$$3 \mid 3x = a$$

$$x = \frac{1}{3}a \text{ or } \frac{a}{3}$$

Reduction of Equations

19 Reduce $\sqrt{4x+17} = 2\sqrt{x+1}$

$$\begin{array}{r} 2\sqrt{x+1} \\ \sqrt{4x+17} \\ \hline 4x+17 = 4x+4\sqrt{x}+1 \\ 4\sqrt{x}+1=17 \\ 4\sqrt{x}=17-1=16 \\ 16 \overline{) 16x} = \frac{256}{16} \text{ Ans} \end{array}$$

20 Reduce $\frac{\sqrt{6x-2}}{\sqrt{6x}+2} = \frac{4\sqrt{6x}-9}{4\sqrt{6x}+6}$

$$\begin{array}{r} 4\sqrt{6x}-9 \\ \sqrt{6x}+2 \\ \hline +8\sqrt{6x}-18 \\ 4x-9\sqrt{6x} \\ \hline 24x-9\sqrt{6x}-18 \\ \hline -\sqrt{6x}+2\sqrt{6x}=-12+18 \\ -\sqrt{6x} \quad 12 \\ \hline \sqrt{6x} \quad 6 \\ 6 \overline{) 6x} = \frac{36}{6} \text{ Answer} \end{array}$$

By Evolution Art. 299

Prob 6 What number is that the 4th part of whose square, being subtracted from 8 leaves a remainder equal to 4

Then $8 - \frac{x^2}{4} = 4$

$$32 - x^2 = 16$$

$$-x^2 = 16 - 32$$

$$\frac{-x^2}{x} = \frac{-16}{x}$$

$$x = 4 \text{ Answer}$$

W. H. McCormick

Reduction of Equations by evolution

7 What two numbers are those whose sum is to the greater as 10 to 7 and whose sum multiplied into the less produces 270

$$\begin{array}{r} 7x \\ 10x \\ \hline 17x \\ 3x \text{ less} \end{array} \quad (7x + 3x) \times 3x = 270$$

$$30 \overline{) 30x^2 = 270}$$

$$x^2 = 9 = x = 3 \text{ Ans}$$

$$7x = 7 + 3 = 21 \text{ greater}$$

$$3x = 3 \times 3 = 9 \text{ less}$$

8 What two numbers are those whose difference is to the greater as 2 to 9 and the difference of whose squares is 128

Ans 18 and 14

$$\begin{array}{r} 9x \\ 7x \\ \hline 2x \\ 9x \text{ greater} \\ 7x \text{ less} \end{array} \quad \begin{array}{r} 9x \\ 7x \\ \hline 2x \\ 81x^2 \\ 49x^2 \\ \hline 32x^2 \end{array}$$

$$32 \overline{) 32x^2 = 128}$$

$$x^2 = 4$$

$$x = 2$$

$$9x = 9 \times 2 = 18$$

$$7x = 7 \times 2 = 14 \text{ Ans}$$

9 It is required to divide the number 18 into 2 such parts that the squares of those parts may be to each other as 25 to 16

Ans 10 and 8

$$\begin{array}{r} x \text{ greater} \\ 18-x \text{ less} \end{array} \quad x^2 : (18-x)^2 :: 25 : 16$$

$$16x^2 = 25 \times (18-x)^2$$

$$4x = 5 \times (18-x)$$

$$4x = 90 - 5x$$

$$9 \overline{) 90} = 10 \text{ greater}$$

10 It is required to divide the number 14 into two such parts that the quotient of the greater divided by the less may be to the quotient of the less divided by the greater as 16 to 9

Ans 8 and 6

$$\begin{array}{r} x \text{ greater} \\ 14-x \text{ less} \end{array} \quad \frac{x}{14-x} : \frac{14-x}{x} :: 16 : 9$$

$$\frac{9}{14-x} = \frac{224-16x}{x}$$

$$9x^2 = 3136 - 224x + 16x^2$$

$$3x = 56 - 4x$$

$$7x = 56$$

$$x = 8 \text{ greater}$$

$$\frac{14}{8} = \frac{7}{4}$$

$$\frac{14}{6} = \frac{7}{3}$$

$$6 \text{ less}$$

Equations By W. M. H.

11 What two numbers are as 5 to 4 the sum of whose cubes is 5103 Ans 15 and 12

$$\begin{array}{r} 5x \\ 3x \\ \hline 25x^2 \\ 125x^3 \\ \hline 125x^3 \\ 64x^3 \\ \hline 189 \end{array} \quad \begin{array}{r} 4x \\ 4x \\ \hline 16x^2 \\ 64x^3 \\ \hline 64x^3 \\ 128x^3 \\ \hline 128x^3 \\ 189x^3 \\ \hline 189 \end{array} \quad \begin{array}{l} + \\ - \\ \hline \end{array} \quad \begin{array}{l} 125x^3 \\ 64x^3 \\ \hline 189x^3 \end{array} = 5103$$

$$189 \quad \frac{189x^3}{x^3} = 5103$$

$$x^3 = 27 = x = 3$$

4
12 less
5
15 greater

12 Two travellers A and B set out to meet each other A leaving the town C at the same time that B left D They travelled the direct road between C and D and on meeting it appeared that A had travelled 18 miles more than B and that A could have gone B's distance in $15\frac{3}{4}$ days but B would have been 28 days in going A's distance Required the distance between C and D 72 A's 54 B

Sup x the number of miles A traveled
the x-18 the number B traveled

$\frac{x-18}{15\frac{3}{4}}$ A's daily Then $x : x-18 :: \frac{x-18}{15\frac{3}{4}} : \frac{x}{28}$

$\frac{x}{28} B \quad \frac{x^2}{28} = \frac{x-18}{x-18}$

$\frac{x^2}{28} = \frac{x^2 - 18x}{x^2 - 36x + 324}$

$\frac{63x^2}{4} = 28x^2 - 1008x + 9072$

$163x^2 = 112x^2 - 4032x + 36288$

$9x^2 = 16x^2 - 576x + 5184$

$3x = 4x - 72$

$4x - 72 = 3x$

$4x - 3x = 72$

$\frac{3x}{x} = 72$ A's distance $\frac{72}{54} B \quad \frac{54}{126} \text{ Prov}$

Equations Continued 1844

Find two numbers which are to each other as 8 to 5 and whose product is 360 Ans 24 and 15

$$8x \times 5x = 360$$
$$40 \overline{) 360} \quad \begin{array}{r} 8x \\ 5x \end{array}$$
$$x^2 = 9 \quad x = 3$$
$$\frac{8}{24} \text{ and } \frac{5}{15} \text{ Ans}$$

14 A gentleman bought two pieces of silk which together measured 36 yds each of them cost as many shillings by the yd. as there were yds in the piece and there whole prices were as 4 to 1 What were the lengths of the pieces

$$\begin{array}{r} x \text{ Sup} \\ x \\ \hline x^2 \end{array} \quad \begin{array}{r} 36-x \text{ Sup} \\ 36-x \\ \hline \end{array} \quad \text{Ans } 24 \text{ and } 12 \text{ yds}$$

$$x^2: \frac{1296 - 36x}{1296 - 72x + 4x^2} \div 4:1$$

$$x^2 = 3184 - 288x + 4x^2$$

$$x = 72 \quad \text{---} \quad 2x \quad \begin{array}{r} 36 \\ 24 \\ 12 \end{array}$$

$$3/3x = 72 \quad \text{greater} \quad \begin{array}{r} 36 \\ 24 \\ 12 \end{array} \quad \text{less}$$

$$x = 24$$

15 Find two numbers which are to each other as 3 to 2 and the difference of whose fourth powers is to the sum of their cubes as 26 to 7. Ans 6 and 4

$$\begin{array}{r} 3x \\ 3x \\ \hline 9x^2 \\ 9x^2 \\ \hline 27x^3 \\ 3x \\ \hline 81x^4 \\ 16x^4 \\ \hline 65x^4 \end{array}$$

$$\begin{array}{r} 2x \\ 2x \\ \hline 4x^2 \\ 2x \\ \hline 8x^3 \\ 2x \\ \hline 16x^4 \end{array}$$

$$65x^4 : 35x^3 : 26 : 1$$

$$x^2 | 455x^4 = 910x^2$$

$$455 | 455x = 910$$

$$x = 2$$

$$65x^4 \text{ difference } 4$$

$$\begin{array}{r} 27x^3 \\ 8x^3 \\ \hline 35x^3 \end{array}$$

$$3x = 6$$

$$2x = 4$$

$$\text{Sum cut } 2x = 4$$

$$\text{Answer}$$

16 Several gentlemen made an excursion each taking the same sum of money each had as many servants attending him as there were gentlemen the number of \$ each had was double the number of all the servants and the whole sum of money taken out was 3456\$ How many men were there Ans 12

Sup x the men $\frac{x}{x^2}$
 $\frac{x^2}{x^3}$ the servants
 The cube extracted $\frac{2}{2} \frac{12x^3 = 3456}{x^3 = 1728} = x = 12$ Ans

17 A detachment of soldiers from a regiment being ordered to march on a particular service each company furnishing four times as many as there were companies in the whole regiment but these being found insufficient each company furnished three men more When their number was to be increased in the ratio of 17 to 16 How many companies were there in the regiment Ans 12

Sup x the number of companies
 $x \times 4 = 4x$ in one company $x \times 3 = 3x$ increase
 $\frac{4x^2 + 3x}{16} :: \frac{4x^2}{17} :: 17 : 16$
 $x \sqrt{64x^2 + 48x} = 68x^2$
 $64x + 48 = 68x$
 $68x = 64x + 48$
 $68x - 64x = 48$
 $\frac{4}{4} \frac{4x}{4x} = 48$
 $x = 12$ Answer

Quadratic Equations

Reduce $3x^2 - 9x - 4 = 80$ Ans $x = 7$ or 4

$3 \sqrt{3x^2 - 9x = 84}$
 $x^2 - 3x = 28$

$x^2 - 3x + \frac{9}{4} = 28 + \frac{9}{4} = \frac{121}{4}$

$x - \frac{3}{2} = \pm \sqrt{\frac{121}{4}} = \frac{11}{2}$

$x = \frac{3}{2} \pm \frac{11}{2} = 7$ or 4 Ans

1 Reduce $4x - \frac{36-x}{x} = 46$ Ans 12 or $-\frac{3}{4}$

$4 \sqrt{4x^2 - 36 - x = 46x}$

$4 \sqrt{4x^2 - 45x = 36}$
 $x^2 - \frac{45}{4}x = 9$

$x^2 - \frac{45}{4}x + \frac{2025}{64} = \frac{2025}{64} + 9 = \frac{2601}{64}$

$x - \frac{45}{8} = \pm \sqrt{\frac{2601}{64}} = \frac{51}{8}$

$x = \frac{45}{8} \pm \frac{51}{8} = \frac{96}{8} = 12$ or $-\frac{3}{4}$ Ans

Quadratic Equations by W

3 Reduce $4x - \frac{14-x}{x+1} = 14$

$$4x^2 + 4x - 14 + x = 14x + 14 \quad 6x - 8 + 2x - 8 = 20x - 80 - x^2 + 6x - 8$$

$$4 \quad 14x^2 - 9x = 28$$

$$x^2 + 6x + 2x - 20x - 6x = -88 + 16$$

$$x^2 - 18x + 81 = 81 - 72$$

$$x^2 - 18x + 81 = 81 - 72$$

$$x - 9 = \sqrt{9} = 3$$

$$x = 9 \pm 3 = 12 \text{ or } 6 \text{ Ans}$$

7 Reduce $\frac{x+4}{3} - \frac{7-x}{x-3} = \frac{4x+7}{9} - 1$

$$9x^2 + 9x - 108 - 189 + 27x = 12x^2 - 15x - 63 - 27 + 81$$

$$9x^2 + 9x + 27x - 12x^2 + 15x + 27 = 81 - 63 + 108 + 189$$

$$3x^2 - 3x - 189 = 189 - 105$$

$$x^2 - 26x + 169 = 169 - 105$$

$$x^2 - 26x + 169 = 169 - 105$$

$$x - 13 = \sqrt{64} = 8$$

$$x = 13 \pm 8 = 21 \text{ or } 5 \text{ Ans}$$

8 Reduce $\frac{x^2 - 10x + 1}{x^2 - 6x + 9} = x - 3$

$$x^3 - 10x^2 + 1 = x^3 + 9x - 9x^2 + 18x - 27$$

$$10x^2 + 9x - 9x^2 + 18x = -27 - 1$$

$$x^2 + 27x + 729 = 729 - 28$$

$$x^2 + 27x + 729 = 729 - 28$$

$$x + \frac{27}{2} = \sqrt{729 - 28} = \frac{841}{4} = \frac{29}{2}$$

$$x = \frac{29}{2} \pm \frac{29}{2} = 1 \text{ or } 28$$

$$x = \frac{29}{2} \pm \frac{29}{2} = 1 \text{ or } 28$$

$$x^2 - \frac{9x}{4} + \frac{81}{64} = 7 + \frac{81}{64} = \frac{129}{64}$$

$$x - \frac{9}{8} = \sqrt{\frac{519}{64}} = \frac{23}{8}$$

$$x = \frac{9}{8} + \frac{23}{8} = 4 \text{ or } -\frac{1}{4} \text{ Ans}$$

4 Reduce $5x - \frac{3x+5}{3-5} = 2x + \frac{3-6}{2}$

$$10x^2 - 30x - 6x + 6 = 4x^2 - 12x + 3x^2 - 15x + 18$$

$$10x^2 - 30x - 6x - 4x^2 + 12x - 3x^2 + 15x = 18 - 6$$

$$3x^2 - 24x = 12$$

$$x^2 - 8x = 4$$

$$x^2 - 8x + 16 = 4 + 16 = 20$$

$$x - 4 = \sqrt{20} = \frac{5}{2}$$

$$x = 4 \pm \frac{5}{2} = 4 \text{ or } -1 \text{ Ans}$$

5 Reduce $\frac{16}{x} - \frac{100+9x}{4x^2} = 3$

$$64x^2 - 100x + 9x^2 = 12x^3$$

$$64x^2 - 100 + 9x = 12x^2$$

$$12x^2 - 73x = -100$$

$$x^2 - \frac{73x}{12} = \frac{100}{12}$$

$$x^2 - \frac{73x}{12} + \frac{5329}{576} = \frac{5329}{576} + \frac{100}{12} = \frac{529}{576}$$

$$x - \frac{73}{24} = \sqrt{\frac{529}{576}} = \frac{23}{24}$$

$$x = \frac{73}{24} + \frac{23}{24} = 4 \text{ or } -2\frac{1}{2} \text{ Ans}$$

$$x = \frac{73}{24} + \frac{23}{24} = 4 \text{ or } -2\frac{1}{2} \text{ Ans}$$

$$24 \overline{) 964}$$

$$24 \overline{) 80} \quad 2\frac{1}{2}$$

$$2 \overline{) \frac{2}{24}} = \frac{1}{12}$$

Quadratic Equations

9 Reduce $\frac{6}{x+1} + \frac{2}{x} = 3$

$$6x + 2x + 2 = 3x^2 + 3x$$

$$3x^2 + 3x - 6x - 2x = 2$$

$$\begin{array}{r} 3x^2 \\ - 8x \\ \hline 3x^2 - 8x = 2 \end{array}$$

$$x^2 - \frac{8x}{3} = \frac{2}{3}$$

$$x^2 - \frac{8x}{3} + \frac{16}{9} = \frac{2}{3} + \frac{16}{9} = \frac{49}{9}$$

$$x - \frac{4}{3} = \sqrt{\frac{49}{9}} = \frac{7}{3}$$

$$x = \frac{4}{3} + \frac{7}{3} = 2 \text{ Ans}$$

11 Reduce $\frac{x}{a} + \frac{a}{x} = \frac{2}{a}$

$$\begin{array}{r} ax^2 + a^3 = 2ax^2 \\ ax^2 - 2ax^2 = -a^3 \\ x^2 - 2x = -a^2 \end{array}$$

$$x^2 - 2x + 1 = 1 - a^2$$

$$x - 1 = \sqrt{1 - a^2}$$

$$x = 1 + \sqrt{1 - a^2} \text{ Ans}$$

14 Reduce $2x^{\frac{2}{3}} + 3x^{\frac{1}{3}} = 2$

$$2x^{\frac{2}{3}} + 3x^{\frac{1}{3}} = 2$$

$$x^{\frac{2}{3}} + \frac{3x^{\frac{1}{3}}}{2} = 1$$

$$x^{\frac{2}{3}} + \frac{3x^{\frac{1}{3}}}{2} + \frac{9}{16} = \frac{9}{16} + 1 = \frac{25}{16}$$

$$x^{\frac{2}{3}} + \frac{3}{4} = \sqrt{\frac{25}{16}} = \frac{5}{4}$$

$$x^{\frac{2}{3}} = \frac{5}{4} - \frac{3}{4} = \frac{2}{4}$$

$$x^{\frac{2}{3}} = \frac{1}{2}$$

$$x = \frac{1}{8} \text{ Answer}$$

$$\sqrt{x} = 7$$

$$x = 49 \text{ Ans}$$

10 Reduce $\frac{3x}{x+2} - \frac{x-1}{6} = x-2$

$$18x - x^2 - x + 2 = 6x^2 - 42x - 108$$

$$6x^2 - 42x - 18x + x^2 + x = -108 + 2$$

$$\begin{array}{r} 6x^2 \\ - 42x \\ - 18x \\ \hline 7x^2 - 59x = -110 \end{array}$$

$$x^2 - \frac{59x}{7} + \frac{3481}{196} = \frac{3481}{196} - \frac{110}{7} = \frac{6561}{196}$$

$$x - \frac{59}{14} = \sqrt{\frac{6561}{196}} = \frac{81}{14}$$

$$x = \frac{59}{14} + \frac{81}{14} = 10 \text{ Ans}$$

12 Reduce $x^4 + ax^2 = b$

$$x^4 + ax^2 = \frac{a^2}{4} = \frac{a^2}{4} + b$$

$$x^2 + \frac{a}{2} = \sqrt{\frac{a^2}{4} + b}$$

$$x = \left(-\frac{a}{2} \pm \sqrt{\frac{a^2}{4} + b} \right)^{\frac{1}{2}} \text{ Ans}$$

13 Reduce $\frac{x^6}{2} - \frac{x^3}{4} = -\frac{1}{2}$

$$128x^6 - 64x^3 = -8$$

$$x^6 - \frac{1}{2}x^3 = -\frac{1}{16}$$

$$x^6 - \frac{1}{2}x^3 + \frac{1}{16} = \frac{1}{16} - \frac{1}{16} = 0$$

$$x^3 - \frac{1}{4} = \sqrt{0}$$

$$x = \sqrt[3]{\frac{1}{4}} \text{ Ans}$$

15 Reduce $\frac{1}{2}x - \frac{1}{3}\sqrt{x} = 22\frac{1}{6}$

$$\frac{x}{2} - \frac{\sqrt{x}}{3} = \frac{133}{6}$$

$$18x - 12\sqrt{x} = 133$$

$$x - \frac{2}{3}\sqrt{x} + \frac{4}{9} = \frac{133}{9} + \frac{4}{9} = \frac{1600}{9}$$

$$\sqrt{x} - \frac{2}{6} = \sqrt{\frac{1600}{9}} = \frac{40}{3}$$

$$\sqrt{x} = \frac{2}{6} + \frac{40}{3} = 7$$

Quadratic Equations

16 Reduce $2x^4 - x^2 + 96 = 99$

$$2 \mid 2x^4 - x^2 + 96 = 99 - 96 \quad \frac{x^4 - \frac{x^2}{2}}{4} = \frac{3}{4}$$

$$x^4 - \frac{x^2}{2} + \frac{1}{16} = \frac{1}{16} + \frac{3}{2} = \frac{25}{16}$$

$$x^2 - \frac{1}{4} = \sqrt{\frac{25}{16}} = \frac{5}{4}$$

$$x^2 = \frac{1}{4} + \frac{5}{4} = \frac{6}{4}$$

$$x^2 = \frac{6}{4}$$

$$x = \sqrt{\frac{6}{4}} = \sqrt{\frac{6}{4}} \text{ or } \frac{1}{2}\sqrt{6} \text{ Ans}$$

17 Reduce $(10+x)^{\frac{1}{2}}$

$$(10+x)^{\frac{1}{2}} = 2$$

$$(10+x)^{\frac{1}{2}} - (10+x)^{\frac{1}{2}} + \frac{1}{4} = 2 + \frac{1}{4} = \frac{9}{4}$$

$$\sqrt{(10+x)^{\frac{1}{2}} - \frac{1}{4}} = \sqrt{\frac{9}{4}} = \frac{3}{2}$$

$$\sqrt{(10+x)^{\frac{1}{2}}} = \frac{1}{2} \pm \frac{3}{2} = 2$$

$$(10+x)^{\frac{1}{2}} = 4$$

$$10+x = 16 = x = 16-10$$

$$x = 6 \text{ Ans}$$

18 Reduce $3x^{2n} - 2x^n = 8$

$$3 \mid 3x^{2n} - 2x^n = 8 \quad \frac{x^{2n} - \frac{2x^n}{3}}{9} = \frac{8}{9}$$

$$x^{2n} - \frac{2x^n}{3} + \frac{4}{9} = \frac{8}{9} + \frac{4}{9} = \frac{12}{9} = \frac{4}{3}$$

$$x^n - \frac{1}{3} = \sqrt{\frac{4}{3}} = \frac{2}{\sqrt{3}}$$

$$x^n = \frac{1}{3} + \frac{2}{\sqrt{3}} = 2$$

$$x = \sqrt[2]{2} \text{ Ans}$$

19 Reduce

$$2 \mid 2(1+x-x^2) - \sqrt{1+x-x^2} = -\frac{1}{2}$$

$$(1+x-x^2) - \frac{1}{2}\sqrt{1+x-x^2} = -\frac{1}{4}$$

$$(1+x-x^2) - \frac{1}{2}\sqrt{1+x-x^2} + \frac{1}{16} = \frac{1}{16} - \frac{1}{4} = -\frac{3}{16}$$

$$\sqrt{1+x-x^2} - \frac{1}{4} = \sqrt{\frac{3}{16}} = \frac{\sqrt{3}}{4}$$

$$\sqrt{1+x-x^2} = \frac{1}{4} + \frac{\sqrt{3}}{4} = \frac{1+\sqrt{3}}{4}$$

$$1+x-x^2 = \frac{(1+\sqrt{3})^2}{16} = \frac{4+4\sqrt{3}+3}{16} = \frac{7+4\sqrt{3}}{16}$$

$$x^2 - x + \frac{1}{4} = \frac{1}{4} + \frac{7+4\sqrt{3}}{16} = \frac{11+4\sqrt{3}}{16}$$

$$x - \frac{1}{2} = \sqrt{\frac{11+4\sqrt{3}}{16}} = \frac{1}{4}\sqrt{11+4\sqrt{3}}$$

$$x = \frac{1}{2} \pm \frac{1}{4}\sqrt{11+4\sqrt{3}} \text{ Answer}$$

20 Reduce

$$\sqrt[3]{a^3 - a^3} = x - b$$

$$a^3 - a^3 = x^3 - 3bx^2 + 3bx - b^3$$

$$3bx^2 - 3bx = a^3 - b^3$$

$$x^2 - bx = \frac{a^3 - b^3}{3b}$$

$$x^2 - bx + \frac{b^2}{4} = \frac{a^3 - b^3}{3b} + \frac{b^2}{4}$$

$$x - \frac{b}{2} = \sqrt{\frac{a^3 - b^3}{3b} + \frac{b^2}{4}}$$

$$x = \frac{b}{2} \pm \sqrt{\frac{4a^3 - 4b^3 + 3b^3 - 4a^3 - b^3}{12b}} \text{ Ans}$$

21 Reduce $\sqrt{4x+2} = \frac{4-\sqrt{x}}{\sqrt{x}}$

$$\frac{2\sqrt{x}+2}{\sqrt{x}} = \frac{16-x}{\sqrt{x}}$$

$$3 \mid 3x + 2\sqrt{x} = 16$$

$$x + \frac{2\sqrt{x}}{3} = \frac{16}{3}$$

$$x + \frac{2\sqrt{x}}{3} + \frac{4}{9} = \frac{16}{3} + \frac{4}{9} = \frac{198}{36}$$

$$\sqrt{x} + \frac{2}{6} = \sqrt{\frac{198}{36}} = \frac{14}{6}$$

$$\frac{4+\sqrt{36}}{4-\sqrt{36}} = \frac{4+6}{4-6} = \frac{10}{-2} = -5$$

$$\sqrt{x} + \frac{2}{6} \pm \frac{14}{6} = 2$$

$$\sqrt{x} = 2$$

$$\text{Ans } x = 4 \text{ Ans}$$

Equation Continued

22

Reduce $x^{\frac{5}{2}} + x^{\frac{5}{2}} = 756$

$$x^{\frac{5}{2}} + x^{\frac{5}{2}} + \frac{1}{4} = 756 + \frac{1}{4} = 3025$$

$$x^{\frac{5}{2}} + \frac{1}{2} = \sqrt{\frac{3025}{4}} = \frac{55}{2}$$

$$x^{\frac{5}{2}} = \frac{1}{2} + \frac{55}{2} = 27$$

$$x^{\frac{5}{2}} = 27$$

$$x^5 = 3^6 = 243 \text{ Ans}$$

24 Reduce

$$2\sqrt{x-a} + 3\sqrt{2x} = \frac{7a+5x}{\sqrt{x-a}}$$

$$2x^2 - a + 3\sqrt{2x} - 2a = \frac{7a+5x}{2x-2a}$$

$$3\sqrt{2x} - 2a = \frac{7a+5x-2x+2a}{2a-2x}$$

$$9x^2 - 20a = \frac{9a+9x}{9a+3x}$$

$$18x^2 - 18ax = 81a^2 + 27aa$$

$$9x^2 - 12ax = 81a^2$$

$$x^2 - 8ax = 9a^2$$

$$x^2 - 8ax + \frac{64}{4} = \frac{64}{4} + 9a^2 = 100a^2$$

$$x - \frac{8}{2} = \sqrt{\frac{100a^2}{4}} = \frac{10a}{2}$$

$$x = \frac{8}{2} + \frac{10a}{2} = 9a \text{ (Answer)}$$

26 Reduce $\sqrt{x^5} + \sqrt{x^5} = 6\sqrt{x}$

$$\sqrt{x^4} + \sqrt{x^2} = 6\sqrt{x}$$

$$x^2 + x = 6$$

$$x^2 + x + \frac{1}{4} = 6 + \frac{1}{4} = \frac{25}{4}$$

$$x + \frac{1}{2} = \sqrt{\frac{25}{4}} = \frac{5}{2}$$

$$x = \frac{1}{2} + \frac{5}{2} = 2 \text{ Ans}$$

23

Reduce $\sqrt{2x+1} + 2\sqrt{x} = \frac{21}{\sqrt{2x+1}}$

$$2x+1+2\sqrt{2x^2+x} = 21$$

$$2\sqrt{2x^2+x} = 21-1-2x = 20-2x$$

$$2\sqrt{2x^2+x} = 20-2x$$

$$4 \times 2x^2 + x = \frac{20-2x}{4} = \frac{400-40x+4x^2}{4}$$

$$8x^2+4x+80x-4x^2 = 400$$

$$4x^2 + 84x = 400$$

$$x^2 + 21x = 100$$

$$x^2 + 21x + \frac{441}{4} = 100 + \frac{441}{4} = \frac{841}{4}$$

$$x + \frac{21}{2} = \sqrt{\frac{841}{4}} = \frac{29}{2}$$

$$x = \frac{29}{2} - \frac{21}{2} = 4 \text{ Answer}$$

250 Reduce

$$x+16-7\sqrt{x+16} = 10-4\sqrt{x+16}$$

$$10-4\sqrt{x+16} = x+16-7\sqrt{x+16}$$

$$\frac{7\sqrt{x+16}}{3\sqrt{x+16}} = \frac{x+6}{x+6}$$

$$7x+16 = x^2+12x+36$$

$$x^2+12x+36 = 7x+144 \text{ change}$$

$$x^2+12x-7x = 144-36$$

$$x^2+5x = 108$$

$$x^2+5x+\frac{25}{4} = 108+\frac{25}{4} = \frac{441}{4}$$

$$x + \frac{5}{2} = \sqrt{\frac{441}{4}} = \frac{21}{2}$$

$$x = \frac{21}{2} - \frac{5}{2} = 9 \text{ Ans}$$

Quadratic Equations

27 Reduce $\frac{4x-5}{x} - \frac{3x-7}{3x+7} = \frac{9x+23}{13x}$

$$x \mid 156x^2 + 169x - 455 - 39x^2 + 91x = 27x^2 + 132x + 161$$

$$156x^2 + 169x - 455 - 39x^2 + 91x = 27x^2 + 132x + 161$$

$$156x^2 + 169x - 39x^2 + 91x - 27x^2 - 132x = 161 + 455$$

$$90x^2 + 260x - 66x^2 = 616$$

$$x \mid 24x^2 + 260x = 616$$

$$x^2 + \frac{64x}{45} = \frac{308}{45}$$

$$x^2 + \frac{64x}{45} + \frac{4096}{8100} = \frac{308}{45} + \frac{4096}{8100} = \frac{59536}{8100}$$

$$x + \frac{64}{90} = \sqrt{\frac{59536}{8100}} = \frac{244}{90}$$

$$x = -\frac{64}{90} + \frac{244}{90} = 2 \text{ Ans}$$

28 Reduce

$$\frac{2}{6x-x^2} + \frac{6}{x^2+2x} = \frac{11}{5x}$$

$$x \mid 15x^2 + 30x + 180 - 30x = 66x - 11x^2 + 132 - 22x^3$$

$$15x^2 + 30x + 180 - 30x = 66x - 11x^2 + 132 - 22x^3$$

$$15x^2 - 30x - 66x + 11x^2 + 22x = 132 - 180 - 30$$

$$x \mid 11x^2 - 59x = 78$$

$$x^2 - \frac{59x}{11} = \frac{78}{11}$$

$$x^2 - \frac{59x}{11} + \frac{3481}{484} = \frac{3481}{484} + \frac{78}{11} = \frac{49}{484}$$

$$x - \frac{59}{22} = \sqrt{\frac{49}{484}} = \frac{7}{22}$$

$$x = \frac{59}{22} + \frac{7}{22} = 3 \text{ Answer}$$

29 Reduce

$$(x-5)^3 - 3(x-5)^2 = 40$$

$$(x-5)^3 - 3(x-5)^2 + \frac{9}{4} = 40 + \frac{9}{4} = \frac{169}{4}$$

$$\sqrt{(x-5)^3 - \frac{3}{2}} = \sqrt{\frac{169}{4}} = \frac{13}{2}$$

$$\sqrt{(x-5)^3} = \frac{3}{2} + \frac{13}{2} = 8$$

$$\sqrt{(x-5)^3} = 8$$

$$(x-5)^3 = 64$$

$$x-5 = 4$$

$$x = 4+5 = 9 \text{ Ans}$$

30 Reduce

$$x + \sqrt{x+6} = 2 + 3\sqrt{x+6}$$

$$2 + 3\sqrt{x+6} = x + \sqrt{x+6}$$

$$3\sqrt{x+6} - \sqrt{x+6} = x - 2$$

$$2\sqrt{x+6} = x - 2$$

$$4x^2 + 6 = x^2 - 4x + 4$$

$$4x^2 + 6 = x^2 - 4x + 4$$

$$4x^2 + 6 = x^2 - 4x + 4$$

$$4x^2 + 6 = x^2 - 4x + 4$$

$$x^2 - 4x + 4 = 4x + 24$$

$$x^2 - 4x - 4x = 24 - 4 = 20$$

$$x^2 - 8x = 20$$

$$x^2 - 8x + 16 = 36$$

$$x - 4 = \sqrt{36} = 6$$

$$x = 4 \pm 6 = 10 \text{ Ans}$$

Problems Equations Contin

Pro² The ages of two brothers are such that their sum is 45 years and their product 500 What is the age of each

$$\begin{aligned} 45 - x & \text{ youngest} \\ x & \text{ eldest} \\ 45x - x^2 &= 500 \\ x^2 - 45x &= -500 \\ x^2 - 45x + \frac{2025}{4} &= \frac{2025}{4} - 500 = \frac{225}{4} \\ x - \frac{45}{2} &= \sqrt{\frac{225}{4}} = \frac{15}{2} \\ x &= \frac{45}{2} \pm \frac{15}{2} = 25 \text{ and } 20 \text{ Ans} \end{aligned}$$

7 Two persons draw prizes in a lottery the difference of which is 120 and the greater is to the less as the less to 10 What are the prizes Ans 2 and 1

$$\begin{aligned} x+120 : x : x : 10 \\ 10x+1200 &= x^2 \\ x^2-10x &= -1200 \\ x^2-10x+25 &= 1225 \\ x-5 &= \sqrt{1225} = 35 \\ x &= 5 \pm 35 = 40 \text{ less } 160 \text{ greater} \end{aligned}$$

8 Divide the number 56 into two such parts that their product shall be 640

$$\begin{aligned} x \times 56 - x &= 640 \\ 56x - x^2 &= 640 \\ x^2 - 56x &= -640 \\ x^2 - 56x + 784 &= 784 - 640 = 144 \\ x - 28 &= \sqrt{144} = 12 \\ x &= 28 \pm 12 = 40 \text{ or } 16 \text{ Answer} \end{aligned}$$

6 To find two numbers whose difference shall be 12 and the sum of their squares 1424

$$\begin{aligned} x^2 + (x+12)^2 &= 1424 \\ x^2 + 24x + 144 &= 1424 \\ 2x^2 + 24x &= 1280 \\ x^2 + 12x &= 640 \\ x^2 + 12x + 36 &= 640 + 36 = 676 \\ x + 6 &= \sqrt{676} = 26 \\ x &= -6 \pm 26 = 20 \text{ less } 32 \text{ greater} \end{aligned}$$

9 What two numbers are those whose sum is 6 and the sum of their cube 72

$$\begin{aligned} x^3 + (6-x)^3 &= 72 \\ x^3 + 216 - 108x + 18x^2 - x^3 &= 72 \\ 18x^2 - 108x + 216 &= 72 \\ 18x^2 - 108x &= 72 - 216 = -144 \\ x^2 - 6x &= -8 \\ x^2 - 6x + 9 &= 9 - 8 = 1 \\ x - 3 &= \sqrt{1} \\ x &= 3 \pm 1 = 2 \text{ and } 4 \text{ Ans} \end{aligned}$$

Quadratic Equations

10 A gentleman bought a number of pieces of cloth for 675^s which he sold again at 48^s by the piece and gained by the bargain as much as one piece cost him. What was the number of pieces? Ans 15

Sup^x the num^r of pieces do $48x - 675 = \frac{675}{x}$
 $\frac{675}{x}$ each piece cost $48x^2 - 675x = 675$
 $48x^2 - 48x$ what sold for $x^2 - 675x = \frac{675}{48}$
 $x^2 - \frac{675x}{48} + \frac{455625}{9216} = \frac{455625}{9216} + \frac{675}{48} = \frac{585225}{9216}$
 $x - \frac{675}{96} = \sqrt{\frac{585225}{9216}} = \frac{765}{96}$
 $x = \frac{675}{96} + \frac{765}{96} = 15$ Ans

11 A and B started together for a place 150 miles distant. A hourly progress was 3 miles more than B's and he arrived at his journey's end 8 hours and 20 minutes before B. What was the hourly progress of each? 8^h 20^m Ans 9 and 6

Sup^x progress of B $\frac{150}{x} - \frac{150}{x+3} = \frac{25}{9}$
 $x+3$ B's progress $450x + 1350 - 450x = 25x^2 + 75x$
 $\frac{150}{x}$ time B travelled 150 m $25x^2 + 75x = 1350$
 $\frac{150}{x+3}$ time A travels $x^2 + 3x = 54$
 $x^2 + 3x + \frac{9}{4} = 54 + \frac{9}{4} = \frac{225}{4}$
 $x + \frac{3}{2} = \sqrt{\frac{225}{4}} = \frac{15}{2}$
 $x = \frac{15}{2} - \frac{3}{2} = 6$ B's
 $x+3 = 9$ A's

12 The difference of two numbers is 6 and if 47 be added to twice the square of the less it will be equal to the square of the greater. What are the numbers? Ans 11 and 5

Sup^x less $\frac{x}{x^2}$ $\frac{x+6}{x^2+12x+36}$
 $x+6$ greater $\frac{x}{x^2} - \frac{x+6}{x^2+12x+36} = \frac{47}{x^2+12x+36}$
 $2x^2 - x^2 - 12x = 36 - 47$
 $x^2 - 12x = -11$
 $x^2 - 12x + 36 = 36 - 11 = 25$
 $x - 6 = \sqrt{25} = 5$
 $x = 6 + 5 = 11$ less
 $x+6 = 17$ greater

Equations contin

Prob 13 A and B distributed 1200 \$ each among a certain number of persons A received 40 persons more than B and B gave each individual 5 \$ more than A How many were received by A and B

Sup x the number B received $\frac{1200}{x} - \frac{1200}{x+40} = 5$ Ans 120 and 80

$$1200x + 48000 - 1200x = 5x^2 + 200x$$

$$5x^2 + 200x = 48000$$

$$x^2 + 40x = 9600$$

$$x^2 + 40x + 400 = 9600 + 400$$

$$x + 20 = \sqrt{10000} = 100 \quad A$$

$$x = 100 - 20 = 80 \quad B \quad 80 + 40 = 120$$

14 Find 2 numbers whose sum is 10 and the sum of their squares 58 x greater $\frac{10-x}{x^2}$ Ans 7 and 3

$$\frac{10-x}{x^2} = \frac{10-x}{x^2}$$

$$100 - 20x + x^2 = 58$$

$$2x^2 - 20x = 58 - 100 = -42$$

$$x^2 - 10x = -21$$

$$x^2 - 10x + 25 = -21 + 25 = 4$$

$$x - 5 = \sqrt{4} = 2$$

$$x = 5 \pm 2 = 7 \text{ greater } \frac{10}{3} \text{ less}$$

15 Several gentlemen made a purchase in company for 175 \$ two of them having withdrawn the bill was paid by the others each furnishing 10 \$ more than would have been his equal share if the bill had been paid by all the company What was the number in the company at first

Sup $x+2$ the number $\frac{175}{x} - \frac{175}{x+2} = 10$ Ans 7

$$175x + 350 - 175x = 10x^2 - 20x$$

$$10x^2 - 20x - 175x + 175x = 350$$

$$x^2 - 2x = 35$$

$$x^2 - 2x + 1 = 36 + 1 = 36$$

$$x - 1 = \sqrt{36} = 6$$

$$x = 1 + 6 = 7 \text{ Answer}$$

Affected

Equations Continued

P16 A merchant bought several yds of linen for 60s out of which he reserved 15 yds and sold the remainder for 54s gaining 10 per cents a yd how many yds did he buy and at what price

Sup x the yds

$$\frac{5400x - 6000x + 90000}{x - 15} = 10 \quad 75 \text{ yds } 80 \text{ cts}$$

$$5400x - 6000x + 90000 = 10x^2 - 150x$$

$$10x^2 - 150x - 5400x + 6000x = 90000$$

$$10 \mid 10x^2 + 450x = 90000$$

$$x^2 + 45x = 9000$$

$$x^2 + 45x + \frac{2025}{4} = 9000 + \frac{2025}{4} = \frac{38025}{4}$$

$$x + \frac{45}{2} = \sqrt{\frac{38025}{4}} = \frac{195}{2}$$

$$x = -\frac{45}{2} + \frac{195}{2} = 75 \text{ yds}$$

75 : 6000 : 1
75 : 6000 : 1

75 : 6000 : 1
75 : 6000 : 1

P17 A and B set out from two towns which were 247 m distant and travelled the direct road till they met A went 9 miles a day and the number of days which they travelled before meeting was greater by 3 than the number of miles which B went in a day how many miles did each travel

Sup x the number of days

$x - 3$ distance B went daily

Then $9x + x^2 - 30x = 247$

$$x^2 - 30x + 90x = 247$$

$$x^2 + 60x + 9 = 247 + 9 = 256$$

$$x + 3 = \sqrt{256} = 16$$

$$x = -3 \pm 16 = 13 \text{ time travelling}$$

P18 A gentleman bought two pieces of cloth the finer of which cost 4 shillings a yard more than the other the finer piece cost 18s but the coarser one ^{which} was 2 yds longer than the finer cost only 16s how many yds were there in each piece and what was the price of a yd of each

Ans 18 yds finer 20 yds coarser prices 20 and 16

Arithmetical Equations

Sup x the number of yds of fine

$x+2$ the coarser

$\frac{18}{x}$ finer per yd

$\frac{16}{x+2}$ coarser per yd

$$\frac{360}{x} - \frac{320}{x+2} = 4$$

$$360x + 720 - 320x = 4x^2 + 8x$$

$$4x^2 + 8x - 360x + 320x = -720$$

$$\frac{328x}{-32x} \quad \frac{8x}{328x}$$

$$4x^2 - 32x = 720$$

$$x^2 - 8x = 180$$

$$x^2 - 8x + 16 = 180 + 16 = 196$$

$$x - 4 = \sqrt{196} = 14$$

$$x = 4 + 14 = 18 \text{ finer piece}$$

$$x+2 = 18+2 = 20 \text{ coarser piece}$$

19 A merchant bought 54 galls of madeira wine and
and a certain quantity of Teneriffe for the former he gave
as many shillings by the gallon as there were galls of
Teneriffe and for the latter 4 shillings less by the gallon
he sold of the mixture at 10s by the gallon and lost
28 £ 16s by his bargain required the price of the madeira
and the number of galls of teriffie / Madeira cost 18s Teneriffe 36s

Sup x the number of galls of teneriffe

$\frac{x}{2}$ price of the madeira by gal

$\frac{x-4}{2}$ price of teneriffe

$$54 \times \frac{x}{2} = \frac{54x}{2} \text{ madeira}$$

$$\frac{x-4}{2} \times x = \frac{x^2 - 4x}{2} \text{ teneriffe}$$

$$54 + \frac{x}{16} \text{ Sold}$$

$$\frac{54x}{2} + \frac{x^2 - 4x}{2} - 540 - 10x = 576$$

$$108x + 2x^2 - 16x - 2160 - 40x = 2304$$

$$108x + 2x^2 - 16x - 40x = 2304 + 2160$$

$$\frac{56x}{52x} \quad \frac{-16x}{-56x} \quad \frac{2160}{4464}$$

$$2x^2 + 52x = 4464$$

$$x^2 + 26x = 2232$$

$$x^2 + 26x + 169 = 2232 + 169 = 2401$$

$$x + 13 = \sqrt{2401} = 49$$

$$x = -13 + 49 = 36 \text{ galls of Teneriffe}$$

$$\frac{x}{2} = \frac{36}{2} = 18 \text{ cost of Madeira}$$

Equations Continued

20 If the square of a certain number be taken from 40 and the square root of this difference be increased by 10 and the sum be multiplied by 2 and the product divided by the number itself the quotient will be 4 What is the number

Sup x the number

$$\sqrt{40-x^2} + 10 = 4x$$

$$2\sqrt{40-x^2} + 20 = 4x$$

$$2\sqrt{40-x^2} + 20 = 4x$$

$$2\sqrt{40-x^2} + 20 = 4x$$

$$4x \sqrt{40-x^2} = 4x^2$$

$$160 - 4x^2 = 4x^2$$

$$16x^2 - 160x + 400 = 160 - 4x^2$$

$$16x^2 - 160x + 4x^2 = 160 - 400$$

$$20x^2 - 160x = -240$$

$$x^2 - 8x = -12$$

$$x^2 - 8x + 16 = 16 - 12 = 4$$

$$x - 4 = \sqrt{4} = 2$$

$$x = 4 \pm 2 = 6 \text{ Ans}$$

21 A person being asked his age replied if you add the square root of it to $\frac{1}{2}$ of it and subtract 12 the remainder will be nothing What was his age

Ans 16 yrs

$$\frac{x}{2} + \sqrt{x} - 12 = 0$$

$$x + 2\sqrt{x} = 24$$

$$x + 2\sqrt{x} + 1 = 24 + 1 = 25$$

$$\sqrt{x} + 1 = \sqrt{25} = 5$$

$$\sqrt{x} = 5 - 1 = 4$$

$$x = 16 \text{ Ans}$$

22

Two casks of wine were purchased for 58 \$ One of which contained 5 galls more than the other and the price by the gallon was 2 \$ less than $\frac{1}{5}$ of the number of gallons in the smaller cask required the number of gallons in each and the price by the gallon

Ans 12 and 17 number price 2 \$ by gallon

Quadratic Equations

Sup x less number

$x+5$ greater

$x-2$ price per gallon

$$\frac{x-6}{3} \times x = \frac{x^2-6x}{3}$$

$$\frac{x-6}{3} \times (x+5) = \frac{x^2-x-30}{3}$$

$$x^2-6x+x^2-x-30 = 58$$

$$x^2-6x+x^2-x-30 = 174$$

$$2x^2-7x = 174+30$$

$$2 \mid 2x^2-7x = 204$$

$$x^2-\frac{7}{2}x = 102$$

$$x^2-\frac{7}{2}x+\frac{49}{16} = 102+\frac{49}{16} = \frac{1681}{16}$$

$$x-\frac{7}{4} = \sqrt{\frac{1681}{16}} = \frac{41}{4}$$

$$x = \frac{7}{4} + \frac{41}{4} = 12 \text{ less } \frac{34}{4}$$

23 On a parcel which 24 coins of silver and copper each silver coin is worth as many cents as there are copper coins and each copper is worth as many cents as there are silver coins and the whole are worth 2816cts how many are there of each

Sup x greatest

$$24-x$$

$$24-x$$

$$24-x$$

$$24-x$$

$$24-x$$

$$24-x$$

$$2 \mid 2x^2-48x = -216$$

$$x^2-24x = -108$$

$$x^2-24x+144 = 144-108$$

$$x-12 = \sqrt{-108+144} = 6$$

$$x = 12 \pm 6 = 18 \text{ the one}$$

$$24-18 = 6 \text{ the other}$$

24 A person bought a certain number of oxen for 80 guineas if he had received 4 more oxen for the same money he would have paid one guinea less for each What was the number of oxen Ans 16

Sup x the number of oxen

$$x+4$$

$$\frac{80}{x} - \frac{80}{x+4} = 1$$

$$80x-80x+320 = x^2+4x$$

$$x^2+4x = 320$$

$$x^2+4x+4 = 324$$

$$x+2 = \sqrt{324} = 18$$

$$x = -2 \pm 18 = 16 \text{ Ans}$$

one or more unknown quantities

Equations containing

given $ax + by = h$
and $x + y = d$

1st $ax + by = h$
2nd $x + y = d \times a$
 $ax + ay = ad$

Sub $by - ay = h - ad$

$y = \frac{h - ad}{b - a}$ and

6 There are two numbers of which the greatest is to the less as 3 to 2 and their sum is the 6th part of their product

Sup $x = \text{greater}$
 $y = \text{less}$

$2 \mid 2x - 3y$
 $x = \frac{3y}{2}$

$x + y = \frac{xy}{6}$

$2x = 3y$

$6x + 6y = xy$

$18y + 6y = 3y^2$

$2 \mid 24y + 24y = 3y^2$

$36 + 24 = 6y$

$6 \mid 6y = 60$

$y = 10$ Ans

7 Given $x + y = 14$ and $x - y = 2$ to find the value of y

$x + y = 14$

$x - y = 2$

$2 \mid 12y = 12$

$y = 6$ Ans

12 What two numbers are those whose difference is to their sum as 2 to 3 and whose sum is to their product as 3 to 5

Sup $x = \text{one}$
 $y = \text{other}$

$x - y : x + y :: 2 : 3$

Ans 10 and 2

$x + y : xy :: 3 : 5$

$3x - 3y = 2x + 2y$

$5x + 5y = 3xy$

$x = 3y - 1$ 1st Equation

$3x - 6 = 2x + 4$

$x = 10$ Ans

$3y - 5 \mid 3xy - 5x = 5y$

$x = \frac{5y}{3y - 5}$

$3y = \frac{5y}{3y - 5}$

$3 \mid 15y^2 - 25y = 5y$

$15y - 25 = 5$

$15 \mid 15y = 30$

$y = 2$ Answer

18 Given $x + y = a$ to find x y and z

$x + y = a$

$x + z = b$

$y + z = c$

$a - c + b + z = b$

$a - c + b + z = b$

$a - c + b - z = 2b$

$az = 2b - b - a + c$

$2 \mid 2z = b - a + c$

$z = \frac{b - a + c}{2}$ Ans

$x = a - y$

$x = b - z$

$a - y = b - z$

$y = c - z$

$a - z = b - c$

$z = a - b + c$

$2 \mid 2z = a - b + c$

$z = \frac{a - b + c}{2}$ Ans

$x + a + c - b = a$

$2x + a + c - b = 2a$

$2x = 2a - a - c + b$

$2 \mid 2x = a - c + b$

$x = \frac{a - c + b}{2}$ Ans

Equations Continued

19 Three persons A B and C purchase a horse for 100 £ but neither is able to pay for the whole the payment would require the whole of A's money together with $\frac{1}{2}$ of B's or the whole of B's with $\frac{1}{3}$ of C's or the whole of C's with $\frac{1}{4}$ of A's how much money had each

$$\begin{aligned} x &= A's \\ y &= B's \\ z &= C's \\ a &= 100 \end{aligned}$$

$$x + \frac{1}{2}y = a$$

$$y + \frac{1}{3}z = a$$

$$z + \frac{1}{4}x = a$$

$$4z + x = 4a$$

$$3y + z = 3a$$

$$2x + y = 2a$$

$$x = 4a - 4z$$

$$x = 2a - y$$

$$\frac{2a - y}{2} = 4a - 4z$$

$$2a - y = 8a - 8z \times 3$$

$$3y = 3a - 24z$$

$$6a - 3y = 24a - 24z$$

$$3y = 3a - 24z$$

$$6a = 27a - 25z$$

$$25z = 27a - 6a$$

$$25z = 21a = 21 \times 100 = 2100$$

$$25 \overline{) 25z} = 2100$$

$$z = 84$$

$$4 \times 84 + x = 4a$$

$$336 + x = 4a = 400$$

$$x = 400 - 336$$

$$x = 64$$

$$2 \times 64 + y = 2a = 200$$

$$y = 200 - 128$$

$$y = 72$$

$$x = 64 \quad y = 72 \quad z = 84$$

Answer

20 The sum of the distance which 3 persons A B and C have travelled is 62 miles A's distance is equal to 4 times C's added to twice B's and twice A's added to 3 times B's is equal to 17 times C's What are the respective distances

$$x = A's$$

$$y = B's$$

$$z = C's$$

$$18 + 4z = 62 - y - z$$

$$5z = 62 - y - 18$$

$$5z = 44 - y$$

$$z = 7 \frac{1}{5}$$

$$9z = 7y \times 5$$

$$5z = 62 - 3y \times 9$$

$$45z = 558 - 27y$$

$$45z = 558 - 27y$$

$$0 = 558 - 82y$$

$$62 \overline{) 62y} = 558$$

$$y = 9$$

$$x = (2 \times 9) + (4 \times 7)$$

$$x = 18 + 28$$

$$x = 46$$

$$x + y + z = 62$$

$$x = 46 + 2y$$

$$2x + 3z = 17z$$

$$x = 62 - y - z$$

$$x = 23 + 4z$$

$$x = 17z - 2y$$

$$17z - 2y = 2y + 4z$$

$$17z - 2y = 4z + 8z$$

$$2y + 4z = 62 - y - z$$

$$17z - 2z = 4z + 2y$$

$$15z = 2y$$

$$4z + z = -2y - y + 62$$

$$5z = -3y + 62$$

Q1 To find x y and z from the equation

$$\begin{aligned} \text{equation } \frac{1}{2}x + \frac{1}{3}y + \frac{1}{4}z &= 62 = a \\ \text{and } \frac{1}{3}x + \frac{1}{4}y + \frac{1}{5}z &= 47 = b \\ \frac{1}{4}x + \frac{1}{5}y + \frac{1}{6}z &= 38 = c \end{aligned}$$

$$\begin{aligned} 20x + 15y + 12z &= 606 \times 47 \\ 20x &= -400 - 1440 + 2820 \\ &= -900 + 2340 \\ &= 1440 \end{aligned}$$

$$\begin{aligned} 20/20x &= 480 \\ x &= 24 \end{aligned}$$

any

$$\begin{aligned} 12x + 8y + 6z &= 24a \\ 20x + 15y + 12z &= 606 \\ 30x + 24y + 20z &= 120c \end{aligned}$$

$$\begin{aligned} 12/12x &= 24a - 8y - 6z \\ x &= 24a - 8y - 6z \end{aligned}$$

$$\begin{aligned} 20/20x &= 606 - 15y - 12z \\ x &= 606 - 15y - 12z \end{aligned}$$

$$\begin{aligned} 30/30x &= 120c - 24y - 20z \\ x &= 120c - 24y - 20z \end{aligned}$$

$$120c - 24y - 20z = 606 - 15y - 12z$$

$$\begin{aligned} 2400c - 480y - 400z &= 18006 - 450y - 360z \\ 24a - 8y - 6z &= 606 - 15y - 12z \end{aligned}$$

$$480a - 160y - 120z = 7206 - 180y - 144z$$

$$\begin{aligned} 180y - 160y + 144z - 120z &= 7206 - 480a \\ -160y + 24z &= 7206 - 480a \end{aligned}$$

$$\begin{aligned} -480y + 480y - 400z + 360z &= 18006 - 2400c \\ -400z + 360z &= 18006 - 2400c \end{aligned}$$

$$\begin{aligned} 20y + 24z &= 7206 - 480a \times 3 \\ -30y - 40z &= 18006 - 2400c \times 2 \end{aligned}$$

$$\begin{aligned} -60y - 80z &= 36006 - 4800c \\ 60y + 72z &= 21606 - 1440a \end{aligned}$$

$$\begin{aligned} -90y - 40z &= 18006 - 2400c \\ -90y - 4800 &= 18006 - 2400c \end{aligned}$$

$$\begin{aligned} 47 & 38 \\ 12600 & 19200 \\ 1200 & 4200 \end{aligned}$$

$$\begin{aligned} 30y &= 4800 + 84600 - 91200 \\ &= 4800 + 84600 - 91200 \\ &= 89400 - 1800 \end{aligned}$$

$$\begin{aligned} 30/30y &= 1800 \\ y &= 60 \end{aligned}$$

$$\begin{aligned} 40320 & 2880 & 38400 \\ 23040 & 8640 & 14400 \\ 270720 & 89280 & 182400 \end{aligned}$$

$$\begin{aligned} 8/83 &= 960 \\ 3 &= 120 \end{aligned}$$

E 11 26 8

Equation Cat

22 Given $\begin{cases} xy = 600 \\ xz = 900 \\ yz = 200 \end{cases}$ to find x , y and z

$$\frac{3}{x} \cdot \frac{3}{z} = \frac{300}{3}$$

$$x = \frac{900}{3}$$

$$\frac{3}{y} \cdot \frac{3}{z} = \frac{600}{3}$$

$$x = \frac{600}{3}$$

$$\frac{600}{y} = \frac{900}{z}$$

$$600z = 900y$$

$$3 \mid yz = 200$$

$$y = \frac{200}{3}$$

$$300 \mid 900y = 600z$$

$$y = \frac{600z}{300}$$

$$y = \frac{2z}{3}$$

$$0 = \frac{2z}{3} - 2z$$

$$y = 2z = y = 20$$

$$x = \frac{600}{y} = \frac{600}{20} = 30$$

$$x = 30$$

$$y = 20$$

$$z = 10 \text{ Ans}$$

$$2z = \frac{200}{3}$$

$$2 \mid 2z^2 = 200$$

$$z^2 = 100$$

$$z = \sqrt{100} = 10 - z = 10$$

24 Given $\begin{cases} w + 50 = x \\ x + 120 = 3y \\ y + 120 = 2z \\ z + 195 = 3w \end{cases}$ to find w , x , y and z

$$x = w + 50$$

$$x = 3y - 120$$

$$z = \frac{y + 120}{2}$$

$$z = \frac{3w - 195}{3}$$

$$w + 50 = 3y - 120$$

$$3w - 195 = y + 120$$

$$6w - 390 = y + 120$$

$$w - 3y = 120 - 50 \times 6$$

$$\text{take } 6w - y = 120 + 390$$

$$\text{from } 6w - 18y = 720 - 300$$

$$-17y = -840 - 690$$

$$-17y = -1530$$

$$y = 90$$

$$x = 100 + 50$$

$$x = 150$$

$$z = \frac{300 - 195}{3}$$

$$z = 105$$

$$w - 270 = -120 - 50$$

$$w = 270 - 120 - 50$$

$$w = 100$$

$$w = 100$$

$$z = 90$$

$$w = 100$$

$$x = 150$$

$$z = 105$$

$$\text{Ans}$$

25 There is a certain number consisting of two digits the left hand digit is equal to 3 times the right hand digit and if 12 be subtracted from the number itself the remainder will be equal to the square of the left hand digit. What is the number?

Sup $x = \text{left hand digit}$ $3y = x$

$y = \text{right hand}$

equation $10x + y - 12 = x^2$ substituting the value of x

$$x = 3y = 9 \text{ left hand digit}$$

$$9 \text{ the two numbers}$$

$$\frac{9}{10}$$

the number

$$30y + y - 12 = 9y^2$$

$$9y^2 = 30y + y - 12$$

$$9y^2 - 31y = -12$$

$$y^2 - \frac{31y}{9} = -\frac{12}{9}$$

$$y^2 - \frac{31y}{9} + \frac{861}{81} = -\frac{12}{9} + \frac{861}{81}$$

$$\frac{y - \frac{31}{18}}{18} = \frac{849}{81}$$

$$y - \frac{31}{18} = \frac{849}{81} \times 18 = \frac{2522}{9}$$

$$y = \frac{2522}{9} + \frac{31}{18} = 3 \text{ right hand}$$

Continued B.

26 If a certain number be divided by the product of its two digits the quotient will be 2 and if 27 be added to the number the digits will be inverted what is the number Ans 36

x = the right hand
 y = the left hand

$$x \times 10 = 10x + y = 2$$

$$10x + y + 27 = 10y + x$$

$$10x - x = 10y - y - 27$$

$$9x = 9y - 27$$

$$x = y - 3$$

$$10(y - 3) + y = 27(y - 3)$$

$$10y - 30 + y = 27y - 81$$

$$27y - 6y = 10y - 30 + y$$

$$2 \mid 27y - 17y = -30$$

$$10y - 17y = -15$$

$$y^2 - 17y + 289 = \frac{289 - 15}{16} = \frac{49}{16}$$

$$y - \frac{17}{2} = \sqrt{\frac{49}{16}} = \frac{7}{4}$$

$$y = \frac{17}{2} + \frac{7}{4} = 6 \text{ right hand}$$

$$x = 6 - 3$$

$$x = 3$$

$$y = 6$$

$$10x + y = 10(3) + 6 = 36$$

Answer

27 There are two numbers such that if the less be taken from 3 times the greater the remainder will be 35 and if 4 times the greater be divided by 3 times the less + 1 the quotient will be equal to the less What are the numbers Ans 13 and 4

Let x = greater $3x - y = 35$
 y = less $\frac{4x}{3y + 1} = y$

$$4x = 3y^2 + y \times 3$$

$$3x = 35 + y \times 4$$

$$12x = 9y^2 + 3y$$

$$12x = 140 + 4y + 140$$

$$0 = 9y^2 - y + 140$$

$$y = 4 \text{ less}$$

$$x = 13 \text{ greater}$$

$$9 \mid 9y^2 - y = 140$$

$$y^2 - \frac{y}{9} = \frac{140}{9}$$

$$y^2 - \frac{y}{9} + \frac{1}{324} = \frac{140}{9} + \frac{1}{324} = \frac{5041}{324}$$

$$y - \frac{1}{18} = \sqrt{\frac{5041}{324}} = \frac{71}{18}$$

$$y = \frac{1}{18} + \frac{71}{18} = 4 \text{ less}$$

$$y = 4 \text{ less}$$

$$x = 13 \text{ greater}$$

28 There is a fraction such that if 3 be added to the numerator the value of the fraction will be $\frac{1}{3}$ but if 1 be subtracted from the denominator the value will be $\frac{1}{5}$ what is the fraction Ans $\frac{2}{11}$

Let x = numerator

y = denominator

$$\frac{x+3}{y} = \frac{1}{3}$$

$$\frac{x}{y-1} = \frac{1}{5}$$

$$3x + 9 = y$$

$$5x = y - 1$$

$$3x - y = -9$$

$$5x - y = -1$$

$$2 \mid 2x = 8$$

$$x = 4 \text{ numerator}$$

$$\frac{x}{y-1} = \frac{1}{5} = \frac{4}{y-1} = \frac{1}{5}$$

$$20 = y - 1$$

$$y = 21 \text{ denominator}$$

Equations B. 48

29 A gentleman has two horses and a saddle which is worth 10 guineas. If the saddle be put on the first horse the value of both will be twice that of the second horse but if the saddle be put on the second horse the value of both will be less than that of the first by 13 guineas what is the value of each horse

Ans 56 and 33

Let $x = 1^{\text{st}} \text{ horse}$
 $y = 2^{\text{nd}} \text{ horse}$

$$x + 10 = 2y \implies x = 2y - 10$$

$$y + 10 = x - 13 \implies x = y + 10 + 13$$

$$2y - 10 = y + 10 + 13$$

$$2y - y = 10 + 10 + 13$$

$$y = 33$$

$$x = 56$$

Ans $y = 33$ second horse $x = 56$ 1st horse

30 Divide the number 90 into 4 such parts that the first increased by 2 the second diminished by 2 the third multiplied by 2 the fourth divided by 2 shall be equal

Ans 18, 22, 10, and 40

Let $x = 1^{\text{st}}$
 $y = 2^{\text{nd}}$
 $z = 3^{\text{rd}}$
 $w = 4^{\text{th}}$

$$\frac{90 - x - y - z}{4}$$

$$x + 2 = 20$$

$$x = 18$$

$$y = 18 + 2 + 2$$

$$y = 22$$

$$x = 18$$

$$z = 10$$

$$w = 40$$

Largest

$$x + 2 = y - 2$$

$$x + 2 = 23$$

$$23 = 90 - x - y - z$$

$$43 = 90 - x - y - z$$

$$x = 90 - y - 53$$

$$x = y - 4$$

$$x = 23 - 2$$

$$90 - y - 53 = y - 4$$

$$90 - y - 53 = 23 - 2 \times 2$$

$$90 - 2y - 53 = -4$$

$$180 - 2y - 103 = 43 - 4$$

$$90 - 53 = 43$$

$$9/43 = 90$$

$$z = 10$$

31 Find 3 such numbers that the first with the sum of the second and third shall be 120 the second with $\frac{1}{5}$ the difference of the third and first shall be 70 and $\frac{1}{2}$ the sum of the 3 numbers shall be 95

Sup $x = \text{one}$

$y = 2^{\text{nd}}$

$z = 3^{\text{rd}}$

$$x + \frac{y + z}{2} = 120 = a$$

$$y + \frac{z - x}{5} = 70 = b$$

$$x + y + z = 95 = c$$

Equations Continued

$$\begin{array}{rcl}
 2x + y + z & = & 2a \\
 5y + z - x & = & 5b \\
 x + y + z & = & 2c \\
 \hline
 2x + y + z & = & 2a \\
 11x + 6y + z & = & 240 \\
 \hline
 z & = & 75 \\
 z & = & 75 \\
 x & = & 50 \\
 y & = & 65 \\
 \text{(Ans)} & &
 \end{array}$$

$$\begin{array}{rcl}
 2a - 2x - y & = & 5b + x - 5y \\
 2a - 2x - y & = & 2c - x - y \\
 \hline
 2a - 5b & = & 3x - 4y \\
 2a - 2c & = & x \\
 \hline
 240 - 350 & = & 150 - 4y \\
 4y & = & 260 \\
 y & = & 65 \\
 \hline
 2a & = & 240 \\
 5b & = & 350
 \end{array}$$

two equations

$$\begin{array}{rcl}
 2x \cdot 120 - 2x \cdot 95 & = & 50 \\
 240 - 350 & = & 150 - 4y \\
 4y & = & 260 \\
 y & = & 65
 \end{array}$$

32 What two numbers are those whose difference sum and product are as the numbers 2, 3 and 5

Let x = one
 y = other

$$\begin{array}{rcl}
 x - y & : & x + y : 2 : 3 \\
 x + y & : & xy : 3 : 5 \\
 \hline
 3x - 3y & = & 2x + 2y \\
 5x + 5y & = & 3xy \\
 \hline
 3x - 3xy & = & 5y \\
 3x - 2x & = & 5y - x = 5y \\
 \hline
 3x - 2x & = & 10y \\
 x & = & 10y \text{ greater}
 \end{array}$$

$$\begin{array}{rcl}
 5y - 15y & = & -5y \\
 25 - 15y & = & -5 \\
 \hline
 15 - 15y & = & -50 \\
 y & = & 2 \text{ less}
 \end{array}$$

33 A vintner sold at one time 20 dozen of port wine and 30 doz of sherry and for the whole received 120 guineas at another time he sold 30 dozen of port and 25 dozen of sherry at the same price as before and for the whole received 140 guineas what was the price of a dozen of each sort of wine

Let x = price of port per doz
 y = do sherry

$$\begin{array}{rcl}
 20x + 30y & = & 120 \times 3 \\
 30x + 25y & = & 140 \times 2 \\
 \hline
 60x + 90y & = & 360 \\
 60x + 50y & = & 280 \\
 \hline
 40y & = & 80 \\
 y & = & 2 \text{ price of sherry}
 \end{array}$$

$$\begin{array}{rcl}
 20x + 60 & = & 120 \\
 20x & = & 120 - 60 \\
 20x & = & 60 \\
 x & = & 3 \text{ price port}
 \end{array}$$

34 A merchant having mixed a certain number of gallons of brandy and water found that if he had mixed 6 galls ^{more} of each he would have put into the mixture 7 galls of brandy for every 6 of water but if he had mixed 6 less of each he would have put in 6 gallons of brandy for every 5 of water how many gal of each did he mix

Ans 78 brandy 66 water

Equations By R. M.

Let x = brandy $x+6 : y+6 :: 7 : 6$
 y = water $x-6 : y-6 :: 6 : 5$

$$\begin{array}{r} 5x-30=396-36 \\ 5x=396+30-36 \\ 5x=426-36 \\ 5x=390 \\ x=78 \text{ Brandy} \end{array} \quad \begin{array}{r} 6x+36=7y+42 \times 5 \\ 5x-30=6y-36 \times 6 \\ 30x+180=35y+210 \\ 30x+180=36y-216 \\ +360 = y-426 = y=426-360 \\ y=66 \text{ water} \end{array}$$

35 What fraction is that whose numerator being doubled and the denominator increased by 7 the value becomes $\frac{2}{3}$ but the denominator being doubled and the num.^r increased by 2 the value becomes $\frac{3}{5}$

Let x = numerator $\frac{2x}{y+7} = \frac{2}{3} = 6x = 2y+14$ Ans $\frac{4}{5}$
 y = denom. $\frac{x+2}{2y} = \frac{3}{5} = 5x = 6y-4$ ay 58

$$\begin{array}{r} 6y = 2x+10 \\ 6y = 36 \\ y = 5 \text{ den.} \end{array} \quad \begin{array}{r} 6x = 2y+14 \\ 6x = 18x-42 \\ 0 = 13x-52 \\ 13x = 52 \\ x = 4 \text{ num.} \end{array}$$

36 A person expended 30 cts in apples and pears giving a cent for 4 apples and a cent for 5 pears he afterward parts with $\frac{1}{2}$ of his apples and $\frac{1}{3}$ of his pears the cost of which was 13 cents how many did he buy of each

Let x = apples
 y = pears

Ans 2 apple and 60 pears

$$\begin{array}{r} 4 : 1 : x = \frac{x}{4} \\ 5 : 1 : y = \frac{y}{5} \end{array}$$

$$\begin{array}{r} \frac{x}{4} + \frac{y}{5} = 30 \\ 4 : 1 : \frac{x}{4} = \frac{x}{8} \\ 5 : 1 : \frac{y}{5} = \frac{y}{15} \end{array}$$

$$\begin{array}{r} \frac{x}{8} + \frac{y}{15} = 15 \\ 15x + 8y = 1560 \end{array}$$

2d equation

$$\frac{x}{4} + \frac{y}{5} = 30$$

$$5x + 4y = 600 \times 3$$

$$15x + 12y = 1800$$

$$15x + 8y = 1560$$

$$4y = 240$$

$$y = 60 \text{ Pears}$$

$$15x + 8 \times 60 = 1560$$

$$15x = 1560 - 480$$

$$15x = 1080$$

$$x = 72 \text{ Apples}$$

Ratio By W. H. M.

1 Which is the greatest the ratio of 11:9 or that of 44:35

$$\frac{11}{9} = \frac{383}{315}$$

$$\frac{44}{35} = \frac{396}{315}$$

Ans 44:35 greatest

2 Which is the greatest the ratio of $a+3 : \frac{1}{3}a$ or that of $2a+7 : \frac{1}{3}a$

$$\frac{a+3}{\frac{1}{3}a} = \frac{6a+18}{a}$$

$$\frac{2a+7}{\frac{1}{3}a} = \frac{6a+21}{a}$$

$2a+7 : \frac{1}{3}a$ the greatest

3 If the antecedent of a couplet be 65 and the ratio 13 What is the consequent

Ans 5

$$13 \overline{) 65} \underline{5} \quad 65 : 5 = 13$$

4 If the consequent of a couplet be 7 and the ratio 18 What is the antecedent

Ans 126

$$18 \times 7 = 126 \quad 126 : 7 = 18$$

5 What is the ratio compounded of the ratios of $3:7$ and $2a:5b$ and $7x+1:3y-2$

$$\frac{3}{2a} : \frac{7}{5b} : \frac{7x+1}{3y-2}$$

$$42ax+6a : 105by-70b$$

6 What is the ratio compounded of $x+y:b$ and $x-y:a+b$ and $a+b:h$

$$\frac{x+y}{x-y} : \frac{b}{a+b} : h$$

$$a+b : \frac{ax^2-ay^2+bx^2-b^2y^2}{x^2-y^2} : abh+b^2h$$

Ans

7 If the ratios of $5x+7:2x-3$ and $x+2:\frac{1}{2}x+3$ be compounded will they produce a ratio of greater inequality or less inequality

Ans a ratio of greater inequality

Ratio contd.

$$5x+7 : 2x-9$$

$$x+2 : x+6$$

$$\frac{1}{2}x+3 = \frac{x+6}{2}$$

$$5x^2 + 17x + 14 : 2x^2 + 9x - 18$$

$$5x^2 + 17x + 14 : 2x^2 + 9x - 18$$

$$\frac{10x^2 + 34x + 28}{2x^2 + 9x - 18} \text{ A ratio of greater inequality}$$

8 What is the ratio compounded of $x+y : a$ and $x-y : b$ and $b : \frac{x^2-y^2}{a}$ Ans

$$x+y : a$$

$$x-y : b$$

$$b : \frac{x^2-y^2}{a}$$

$$ab : x^2 - y^2$$

$$x^2 + 2xy - y^2 : ab$$

$$x^2 - y^2 : ab$$

$$ab : x^2 - y^2$$

$$abx^2 - aby^2 : abx^2 - aby^2 \text{ A ratio of equality}$$

9 What is the ratio compounded of $4 : 5$ and the duplicate ratio of $4 : 9$ and the triplicate ratio of $3 : 2$

$$4 : 5$$

$$16 : 81$$

$$112 : 405$$

$$24 : 8$$

$$484 : 3240$$

$$216 : 13024 : 3240$$

$$14 : 15$$

10 What is the ratio compounded of $3 : 4$ and the triplicate ratio of $x : y$ and the subduplicate ratio of $49 : 9$ Ans $x^2 : y^2$

$$3 : 4$$

$$x^3 : y^3$$

$$3x^3 : 4y^3$$

$$7 : 3$$

$$21 : 21x^3 : 21y^3$$

$$x^2 : y^2 \text{ Ans}$$

Proposition

Prob 10

There are two numbers whose product is 135 and the difference of their squares is to the square of their differences as 4 to 1 What are the numbers Ans 15 and 9

Supp x = one
 y = other

$$xy = 135$$

$$x^2 - y^2 : (x - y)^2 :: 4 : 1$$

$$\frac{x^2 - y^2}{x - y} : \frac{(x - y)^2}{x - y} :: 4 : 1$$

$$x^2 - y^2 : x^2 - 2xy + y^2 :: 4 : 1$$

$$x - y \mid \frac{x^2 - y^2}{x - y} : \frac{x^2 - 2xy + y^2}{x - y} :: 4 : 1$$

$$2x : x - y :: 5 : 1$$

$$5x - 5y = 2x$$

$$3x = 5y$$

$$x = \frac{5}{3}y$$

$$x \times y = 135$$

$$5y^2 = 135$$

$$y^2 = 27$$

$$y = \sqrt{27} = 9$$

$$3x = 5y$$

$$3 \mid 135 = 45$$

$$x = 15$$

$$y = 9$$

Ans

11 What two numbers are those whose difference sum and product are as the numbers 2, 3 and 5 respectively

Supp x = one
 y = other

$$x - y : x + y : 2 : 3$$

$$x + y : xy : 3 : 5$$

$$x - y : x + y : 2 : 3$$

$$2x : x + y : 5 : 3 = \frac{6x = 5x + 5y}{-5x}$$

$$5x + 5y = 3xy$$

$$3 \mid 25y + 5y = 15y^2$$

$$25 + 5 = 15y$$

$$15 \mid 15y = 30$$

$$y = 2$$

$$x = 5y = x = 2 \times 5 = 10$$

$$y = 2$$

$$x = 10$$

Ans

12 Divide the number 24 into two such parts that their product shall be to the sum of their squares as 3 to 10 Ans 18 and 6

Proportion

Let x = greater
 $24 - x$ = less

$$24x - x^2 : (24 - x)^2 + x^2 :: 3 : 10$$

$$24x - x^2 : \frac{576 - 48x + x^2 + x^2}{24x - x^2} :: 3 : 10$$

$$24x - x^2 : 576 - 48x + 2x^2 :: 3 : 10$$

$$24x - x^2 : 576 - 48x + 2x^2 :: 3 : 10$$

$$24x - x^2 : 576 - 48x + 2x^2 :: 3 : 10$$

$$384x - 16x^2 = 1728$$

$$16(16x^2 - 384x) = -1728$$

$$x^2 - 24x = -108$$

$$x^2 - 24x + 144 = 144 - 108$$

$$x - 12 = \sqrt{36} = 6$$

$$x = 12 + 6 = 18 \text{ greater}$$

$$\frac{24}{18} \text{ less}$$

13 In a mixture of rum and brandy the difference between the quantities of each is to the quantity of brandy as 100 is to the number of gallons of rum and the same difference is to the quantity of rum as 4 to the number of galls of brandy how many galls of brandy each

Ans 25 rum 5 brandy

Let x = rum
 y = brandy

Subtrac $x - y : y :: 100 : x$
 $x - y : x :: 4 : y$

$$\frac{x - y}{x} = \frac{y}{100}$$

$$\frac{x - y}{x} = \frac{y}{100}$$

$$100x - 100y = xy$$

$$4(14x - 100y) = 100y - 400$$

$$x^2 - xy = 100y \text{ first equation}$$

$$25x - 100$$

$$25x - 100$$

$$625x^2 - 5000y + 10000 - 25y^2 + 1000y = 10000$$

$$625x^2 - 5000y + 10000 - 25y^2 + 1000y = 10000$$

$$625x^2 - 5000y - 25y^2 = -10000$$

$$600[6000y^2 - 5000y = -10000$$

$$y^2 - 50y = -100$$

$$y^2 - 50y + 2500 = \frac{2500 - 100}{144} = \frac{100}{144}$$

$$y - \frac{50}{12} = \sqrt{\frac{100}{144}} = \frac{10}{12}$$

$$y = \frac{50}{12} + \frac{10}{12} = 5 \text{ Brandy}$$

$$x = 25y - 100 = 25(5) - 100$$

$$x = 25 \text{ rum}$$

Continued

14 There are two numbers which are to each other as 3 to 2 if 6 be added to the greater and subtracted from the less the sum and remainder will be to each other as 3 to 1 what are the numbers

Let x = one
 y = other

$$x : y :: 3 : 2$$

$$x + 6 : y - 6 :: 3 : 1$$

$$x + y : y - 6 :: 4 : 1$$

$$x + y : y :: 5 : 2$$

$$x + y = 4y - 24$$

$$x = 3y - 24$$

$$2x = 3y$$

First Equation

$$3y - 24 \times 2 = 3y$$

$$2x = 3y - 3 \times 16$$

$$6y - 48 = 3y$$

$$2 \mid 2x = 48$$

$$x = 24 \text{ Greater}$$

$$6y - 3y = 48$$

$$3 \mid 3y = 48$$

$$y = 16 \text{ Less}$$

$$y = 16$$

$$x = 24$$

Ans

15 There are two numbers whose product is 320 and the difference of their cubes is to the cube of their difference as 61 to 1 What are the numbers

Let x = one
 y = other

$$xy = 320 \times 3$$

$$x^3 - y^3 : (x - y)^3 :: 61 : 1$$

Ans 20 and 16

$$\frac{x^3 - y^3}{x^2 - 2xy + y^2} = \frac{x^3 - y^3}{x - y}$$

$$\frac{x^3 - y^3}{x^2 - 2xy + y^2} = \frac{x^3 - y^3}{x - y}$$

$$x^3 - y^3 : x^2 - 2xy + y^2 :: 61 : 1$$

$$x^3 - y^3 : (x - y)^3 :: 61 : 1$$

$$3xy : (x - y)^2 :: 60 : 1$$

$$3xy = 960$$

$$960 : x^2 - 2xy + y^2 :: 60 : 1$$

$$60 \mid 60x^2 - 120xy + 60y^2 = 960$$

$$x^2 - 2xy + y^2 = 16$$

$$y^2 - 2xy + x^2 = 16 - x^2 + x^2 = 16$$

$$y - x = 4$$

$$y = 4 + x$$

$$y = 20$$

$$x = 16 \text{ Ans}$$

$$xy = 320$$

$$x + 4x = 320$$

$$x^2 + 4x + 4 = 320 + 4$$

$$x + 2 = \sqrt{324} = 18$$

$$x = 18 - 2 = 16$$

$$x = 16$$

16 There are two numbers which are to each other in the duplicate ratio of 4 to 3 and 24 is a mean proportional between them what are the numbers Ans 32 and 18

Let x - one
 y - other

$$\sqrt{xy} = 24 \quad \text{substituting value of } x \text{ in first equation}$$

$$\frac{24}{9.6} = \frac{16y}{9} \quad 16y = 576$$

$$y = \frac{576}{16} = 36$$

$$x : y :: 16 : 9$$

$$x + y : y :: 25 : 9$$

$$9x + 9y = 25y$$

$$9x = 16y$$

$$x = \frac{16y}{9}$$

$$y = 18$$

$$x = 32$$

Ans

Progression By Wm

Prob 1 If the first term of an arithmetical progression is 7 the common difference 3 and the number of terms 9 What is the last term

$$l = a + (n-1)d = 7 + (9-1)3 = 31$$

Ans 31

2 If the last term of an increasing progression is 60 the number of terms 12 and the common difference 5 what is the first term Ans 5

$$a = l - (n-1)d = 60 - (12-1)5 = 5$$

Ans 5

3 Find 6 arithmetical means between 1 and 43

$$d = \frac{l - a}{m+1} = \frac{43 - 1}{6+1} = 6$$

Ans 6

Reduce $d = \frac{2s - 2an}{n^2 - n} = dn^2 - da = 2s - 2an$

$$dn^2 - 2an + 2an = 2s$$

$$dn^2 - (2a-d)n = 2s$$

$$d \mid dn^2 - (2a-d)n = 2s$$

$$\frac{n^2 + 2a - a(n)}{d} + \frac{(2a-a)^2}{4d^2} = \frac{(2a-d)^2 + 4s}{4d^2}$$

$$n + \frac{2a-a}{2d} = \frac{\sqrt{(2a-d)^2 + 4s}}{2d}$$

$$n = \frac{\sqrt{(2a-d)^2 + 4s} - 2a + d}{2d}$$

Ans

Progression Arithmetical

Ex 1 If the first term of an increasing progres is 3 the common difference 2 and the number of terms 20 what is the sum of the series Ans 440

$$3 = a + (n-1)d = 3 + (20-1)2 = 41$$

$$S = \frac{a + 3}{2} \times n = \frac{3 + 41}{2} \times 20 = 440 \text{ Ans}$$

2 If 100 stones be placed in a straight line at the distance of a yd from each other how far must a person travel to bring them one by one to a box placed at the distance of a yd from the first stone Ans 5 miles 1300 yds

$$3 = a + (n-1)d$$

$$3 = 2 + (100-1)2 = 200 \text{ last term}$$

$$S = \frac{2 + 200}{2} \times 100 = 10100$$

1760/10100 Sm
8800
1300 yds

3 What is the sum of 150 terms of the series

$$\frac{1}{3}, \frac{2}{3}, 1, \frac{4}{3}, \frac{5}{3}, 2, \frac{7}{3}, \text{ &c}$$

$$\frac{151 = 256}{6} = 42 \frac{5}{6}$$

$$\frac{150}{2} = 75$$

$$42 \frac{5}{6} + 75 = 117 \frac{5}{6} \text{ Ans}$$

$$3 = a + (n-1)d$$

$$3 = \frac{1}{3} + (150-1)\frac{1}{3} = \frac{150}{3}$$

$$S = \frac{\frac{1}{3} + \frac{150}{3}}{2} \times 150 = 3775 \text{ Ans}$$

4 If the sum of an 14 ss the least term 5 and the number of terms 30 what is the common difference

$$d = \frac{2S - 2an}{n^2 - n}$$

$$\text{Ans } 3$$

$$d = \frac{2910 - 300}{900 - 30} = \frac{2610}{870} = 3 \text{ Common Difference}$$

5 If the sum of an arithmet series is 567 the first term 7 and the common difference 2 what is the number of terms Ans 21

$$n = \frac{\sqrt{(2a-d)^2 + 8ds} - 2a + d}{2d}$$

$$n = \frac{\sqrt{(14-2)^2 + 9072} - 14 + 2}{4} = 21$$

$$\begin{array}{r} 12 \\ 144 \\ 9072 \\ 9216 \\ 144 \\ 9360 \\ 144 \\ 9504 \\ 144 \\ 9648 \\ 144 \\ 9792 \\ 144 \\ 9936 \\ 144 \\ 10080 \end{array}$$

$$\frac{96}{-12} = 8$$

$$\frac{84}{4} = 21 \text{ number of terms}$$

Arithmetical

6 What is the sum of 32 terms of the series
 $1 \ 1\frac{1}{2} \ 2 \ 2\frac{1}{2} \ 3 \ \&c$

$$1 + \frac{33}{2} = \frac{2+33}{4}$$

$$S = a + (n-1)d$$

$$S = 1 + (32-1)\frac{1}{2} = \frac{31}{2} + 1 = \frac{33}{2}$$

$$\frac{33}{2} \times 32 = \frac{1120}{4} = 280 \text{ Ans}$$

7 A gentleman bought 47 books and gave 10 cts for the first 30 for the second 50 for the third &c what did he give for the whole

$$S = a + (n-1)d$$

$$S = 10 + (47-1)20 = 930$$

$$S = \frac{a+n}{2} \times n = \frac{10+930}{2} \times 47$$

$$\frac{940}{2} = 470$$

$$470 \times 47 = 22090 \text{ Ans}$$

8 A person put into a charity box a cent the first day of the year two cents the second day 3 cts the third day &c to the end of the year what was the whole sum for 365 days

$$S = a + (n-1)d$$

$$S = 1 + (365-1)1 = 365$$

$$1 + 365 = 366$$

$$\frac{366}{2} \times 365 = 66795 \text{ cts}$$

$$\frac{366}{2} = 183$$

$$183 \times 365 = 66795$$

$$66795 \text{ Ans}$$

Ar. 433 Prob 2 The sum of three numbers in arithmetical progression is 9 and the sum of their cubes is 153 what are the numbers

Sup x = second y = common difference

$$(x-y) + x + (x+y) = 9$$

$$3x = 9$$

$$x = 3 \text{ second number}$$

$$\begin{array}{r} x-y \\ x-y \\ x-y \\ \hline x^3 - 3x^2y + 3xy^2 - y^3 \end{array}$$

$$\begin{array}{r} x \\ x \\ x \\ \hline x^3 + 3x^2y + 3xy^2 + y^3 \end{array}$$

$$x^3 - 3x^2y + 3xy^2 - y^3 + x^3 + 3x^2y + 3xy^2 + y^3 = 153$$

$$2x^3 + 6xy^2 = 153$$

$$3x^3 + 6xy^2 = 153$$

any 1

Progression

3 The sum of three numbers in arithmetic progression is 15 and the sum of the square of the 2 extremes is 58 what are the numbers

Sup x = second
 y = common difference

$$(x-y) + x + (x+y) = 15$$

$$2x + x = 15$$

$$3x = 15$$

$$x = 5 \text{ second term}$$

$$2x^2 = 50$$

$$50 + 2y^2 = 58$$

$$2y^2 = 58 - 50$$

$$2y^2 = 8$$

$$y^2 = 4 \Rightarrow y = 2 \text{ common difference}$$

$$3x^3 + 6xy^2 = 15.3$$

$$x^3 + 2xy^2 = 5.1$$

$$x^3 = 27 + 2 \times 2y^2 = 5.1$$

$$27 + 6y^2 = 5.1$$

$$6y^2 = 5.1 - 27$$

$$6y^2 = -21.9$$

$$y^2 = -3.65$$

$$y = 2 \text{ common difference}$$

$$(x-y) + (x+y) =$$

$$x^2 - 2xy + y^2 + x^2 + 2xy + y^2 = 58$$

$$2x^2 + 2y^2 = 58$$

$$2x^2 + 2y^2 = 58$$

4 There are four numbers in arithmetical Progression the sum of the squares of the two first is 34 and the sum of the squares of the two last is 130 What are the numbers

$x, x+y, x+2y, x+3y$ Ans 3 - 5 - 7 and 9

$$\begin{aligned} x^2 + (x+y)^2 &= 34 \\ x^2 + x^2 + 2xy + y^2 &= 34 \\ 2x^2 + 2xy + y^2 &= 34 \end{aligned}$$

$$2x^2 + 6xy + 5y^2 = 130$$

$$4x^2 + 8xy + 4y^2 = 96$$

$$2xy + y^2 = 24$$

$$2y \mid 2xy = 24 - y^2$$

$$x = \frac{24 - y^2}{2y}$$

$$\begin{aligned} x &= x+y \\ x^2 + (x+y)^2 &= 34 \\ x^2 + x^2 + 2xy + y^2 &= 34 \\ 2x^2 + 2xy + y^2 &= 34 \end{aligned}$$

$$\begin{aligned} x &= x+2y \\ x^2 + (x+2y)^2 &= 130 \\ x^2 + x^2 + 4xy + 4y^2 &= 130 \\ 2x^2 + 4xy + 4y^2 &= 130 \end{aligned}$$

$$1152 - 96y^2 + 2y^4 - 48y + 2y^3 + y^2 = 34$$

$$2304y - 192y^3 + 4y^5 - 192y^3 + 8y^5 + 8y^5 = 272y^3$$

$$2304 - 192y^2 + 4y^4 - 192y^2 + 8y^4 + 8y^4 - 272y^2 = 2304$$

$$4y^4 - 192y^2 + 192y^2 + 8y^4 + 8y^4 - 272y^2 = 2304$$

$$4y^4 - 192y^2 + 192y^2 + 8y^4 + 8y^4 - 272y^2 = 2304$$

$$4y^4 - 192y^2 + 192y^2 + 8y^4 + 8y^4 - 272y^2 = 2304$$

$$4y^4 - 192y^2 + 192y^2 + 8y^4 + 8y^4 - 272y^2 = 2304$$

$$4y^4 - 192y^2 + 192y^2 + 8y^4 + 8y^4 - 272y^2 = 2304$$

$$4y^4 - 192y^2 + 192y^2 + 8y^4 + 8y^4 - 272y^2 = 2304$$

$$4y^4 - 192y^2 + 192y^2 + 8y^4 + 8y^4 - 272y^2 = 2304$$

$$4y^4 - 192y^2 + 192y^2 + 8y^4 + 8y^4 - 272y^2 = 2304$$

$$4y^4 - 192y^2 + 192y^2 + 8y^4 + 8y^4 - 272y^2 = 2304$$

$$4y^4 - 192y^2 + 192y^2 + 8y^4 + 8y^4 - 272y^2 = 2304$$

$$20y^4 - 656y^2 = 2304$$

$$y^4 - 656y^2 = 2304$$

$$y^4 - 656y^2 + 26896 = 26896 - 2304 = 15367$$

$$y^2 - 164 = \sqrt{15367} = 124$$

$$y^2 = 164 + 124 = 4$$

$$y = 2 \text{ common difference}$$

Arithmetical

$$2x^2 + 6xy + 5y^2 = 130$$

$$2x^2 + 12x + 20 = 130$$

$$2x^2 + 12x = 130 - 20 = 110$$

$$2 \quad | \quad 12x + 12x = 110$$

$$x + 6x = 55$$

$$x + 6x + 9 = 55 + 9 = 64$$

$$x + 3 = \sqrt{64} = 8 \text{ term}$$

$$x = -3 \pm 8 = 5 \text{ Second}$$

3. 5. 7. 9. Ans

Sy x - second y - con. diff.

$$10(x-y) + 10 + x + y = 111x - 99y = 26$$

$$111x - 99y = 26 \implies 111x - 99y = 78x$$

$$111x - 99y + 198 = 100(x+y) + 10x + x + y \quad | \quad 33 \quad | \quad 135x = 99y$$

$$111x - 99y + 198 = 111x + 99y \quad | \quad 100x + 100y$$

$$333y - 99y + 198 = 333y + 99y \quad | \quad 100x + 100y$$

$$-99y - 99y = -198 \quad | \quad 100x + 100y$$

$$198 \quad | \quad 198y = 198$$

$$y = 1$$

6 The sum of the squares of the extremes of 4 numbers in arithmetical progression is 200 and the sum of the squares of the means is 136 what are the numbers

Sy x - second number y - con. diff.

$$\begin{matrix} x-y & x & x+y & x+2y \\ x-y & x & x+y & x+2y \\ x^2-2xy+y^2 & x^2 & x^2+2xy+y^2 & x^2+4xy+4y^2 \\ x^2-2xy+y^2 & x^2 & x^2+2xy+y^2 & x^2+4xy+4y^2 \\ x^2-2xy+y^2 & x^2 & x^2+2xy+y^2 & x^2+4xy+4y^2 \\ x^2-2xy+y^2 & x^2 & x^2+2xy+y^2 & x^2+4xy+4y^2 \end{matrix}$$

$$2x^2 + 2xy + y^2 = 200$$

$$2x^2 + 2xy + y^2 = 136$$

$$4 \quad | \quad 4y^2 = 64$$

$$y^2 = 16$$

$$y = 4$$

$$\text{con. difference}$$

$$2 \quad | \quad 12x + 8x = 120$$

$$x^2 + 4x = 60$$

$$x^2 + 4x + 4 = 60 + 4 = 64$$

$$x + 2 = \sqrt{64} = 8$$

$$x = -2 \pm 8 = 6 \text{ second term}$$

2. 6. 10. 14.
Numbers

Geometrical

Find two geometrical means between 4 and 256 Ans. ratio 4

$$\left(\frac{b}{a}\right)^{\frac{1}{n-1}} = r = \left(\frac{256}{4}\right)^{\frac{1}{4-1}} = 4 \text{ ratio}$$

Series 4. 16. 64. 256.

Find three geometrical means between $\frac{1}{8}$ and 9 Ans $\frac{1}{3}$ 1 3

$$\left(\frac{b}{a}\right)^{\frac{1}{n-1}} = r = \left(\frac{9}{\frac{1}{8}}\right)^{\frac{1}{4-1}} = 3$$

$$\left(\frac{1}{8}\right)^{\frac{1}{4-1}} \times 3 = \frac{1}{8} \times 3 = \frac{3}{8} \times 3 = 1 \times 3 = 3 \text{ Series } \frac{1}{8}. 1. 3.$$

Art. 442 Prob. 3 What is the sum of the series 1. 3. 9. 27. &c. to 12 terms

$$ar^{n-1} = 1 \times (3)^{11}$$

$$\begin{array}{r} 81 \\ 243 \\ 729 \\ 2187 \\ 6561 \\ 19683 \\ 59049 \\ 3 \times 177147 - 1 = 531440 = 265720 \end{array}$$

4 What is the sum of 10 terms of the series 1. $\frac{2}{3}$. $\frac{4}{9}$. &c. $ar^{n-1} = 1 \times \left(\frac{2}{3}\right)^{10-1}$

$$S = \frac{r^n - a}{r - 1} = \frac{\frac{2}{3} \times 512 - 1}{\frac{2}{3} - 1}$$

$$\frac{1024 - 1}{59049} = \frac{1024 - 59049}{59049}$$

$$\frac{58025}{59049} \div \frac{1}{3}$$

$$\frac{58025 \times 3}{59049 \times 1} = \frac{174075}{59049} \text{ Ans}$$

Art. 444.

Prob. 1 Find 3 numbers in geometrical progression such that their sum shall be 14 and the sum of their squares 84

Geometrical

4 Of 4 numbers in geometrical progression the sum of the 2 first is 15 and the sum of the 2 last is 60 What are the numbers

Series $x \quad xy \quad xy^2 \quad xy^3$

$$\begin{array}{r} x + xy = 15 \\ 3/3x = 15 \\ x = 5 \end{array} \quad \begin{array}{r} 15/15y^2 = 60 \\ y^2 = 4 \\ y = 2 \end{array} \quad \begin{array}{r} x + xy = 15 \times y^2 \\ xy^2 + xy^3 = 60 \\ xy^2 + xy^3 = 15y^2 \\ xy^2 + xy^3 = 60 \\ 60 - 15y^2 \end{array}$$

5. 10. 20. 40. Ans

5 A gentleman divided 210 £ among 3 servants in such a manner that, their portions were in geometrical progression and the first had 90 £ more than the last how much had each

Let $x = 1st$
 $y = ratio$

$$\begin{array}{r} x + xy + xy^2 = 210 \\ x + xy = 90 \times y \\ xy + xy^2 = 90y \\ x + xy + xy^2 = 210 \\ x = 210 - 90y \\ 210 - 90y + 210 - 90y \times y = 90 \\ 210 - 90y + 210y - 90y^2 = 90 \\ 210 - 90y + 210y - 90y^2 = 90 \\ 120y - 90y^2 = 90 - 210 \\ 120y - 90y^2 = -90 \\ y^2 - \frac{4}{3}y + \frac{16}{36} = \frac{16}{36} + \frac{4}{3} - \frac{4}{3} \\ y^2 - \frac{4}{3}y + \frac{16}{36} = \frac{16}{36} + \frac{4}{3} - \frac{4}{3} \\ y - \frac{4}{6} = \sqrt{\frac{64}{36}} = \frac{8}{6} \\ y = \frac{4}{6} + \frac{8}{6} = 2 \\ x + 2y = 90 \\ 3/3x = 90 \\ x = 30 \end{array}$$

Ans 30. 60. 120.

6 There are 3 numbers in arithmetical progression the greatest of which exceed the least by 15 and the difference of the squares of the greatest and least is to the sum of the squares of all three numbers as 5 to 7 what are the numbers

Sup $x = first\ number$
 $y = ratio$

$$\begin{array}{r} x^2 - xy = 15 \\ x^2 - xy^2 = x^2 : x^2 + x^2y^2 + x^2y^4 :: 5 : 7 \\ y^4 - 1 : 1 + y^2 + y^4 :: 5 : 7 \\ y^4 - 1 : 2y^4 + y^2 :: 5 : 7 \\ 12y^4 - 12 = 10y^4 + 5y^2 \end{array}$$

Progression

$$x + x \times 2 = 15$$

$$x + 2x = 15$$

$$3/3x = 15$$

$$x = 5 \text{ 1st term}$$

5. 10. 20.

Ans

ratio $r = 2$ common

$$12z^4 - 12 = 10z^4 + 3z^2$$

$$12z^4 - 10z^4 - 3z^2 = 12$$

$$2z^4 - 3z^2 = 12$$

$$z^4 - \frac{3}{2}z^2 = 6$$

$$z^4 - \frac{3}{2}z^2 + \frac{9}{16} = \frac{25}{16} + 6 = \frac{121}{16}$$

$$z^2 - \frac{3}{4} = \sqrt{\frac{121}{16}} = \frac{11}{4}$$

$$z^2 = \frac{3}{4} + \frac{11}{4} = 4$$

There are 4 numbers in geometrical progression the second of which is less than the fourth by 24 and the sum of the extremes is to the sum of the means as 7 to 3 what are the numbers

Ans 1. 3 9. 27.

Sup x = first term

x, xy, xy^2, xy^3

y = ratio

$x | x + xy^3 : xy + xy^2 :: 7 : 3$ second equation

$$1 + y^3 : y + y^2 :: 7 : 3$$

$$y + 1 | y^3 + y^2 + y + 1 : y + y^2 :: 10 : 3$$

$$y^2 + 1 : y :: 10 : 3$$

$$3y^2 + 3 = 10y$$

$$3 | 3y^2 - 10y = -3$$

$$y^2 - \frac{10}{3}y = -1$$

$$y^2 - \frac{10}{3}y + \frac{100}{36} = \frac{100}{36} - 1 = \frac{64}{36}$$

$$y - \frac{10}{6} = \sqrt{\frac{64}{36}} = \frac{8}{6}$$

$$y = \frac{10}{6} + \frac{8}{6} = 3 \text{ Ratio}$$

$$xx \cdot 27 - xx \cdot 3 = 24$$

$$24x - 3x = 24$$

$$24 | 24x = 24$$

$$x = 1$$

First term

1. 3. 9. 27

Answer

$xy^3 - xy = 24$
first equation

Division By

Prob. 14

Divide $a+vy+arvy+ry$ by $a+vy$ Ans $1+rvy$

$$\begin{array}{r} a+vy \overline{) a+vy+arvy+ry} \\ \underline{a+vy} \\ arvy+ry \\ \underline{arvy+vy} \\ ry \end{array}$$

15 Divide $x^3-3ax^2+3a^2x-a^3$ by $x-a$

$$\begin{array}{r} x-a \overline{) x^3-3ax^2+3a^2x-a^3} \\ \underline{x^3-ax^2} \\ -2ax^2+3a^2x \\ \underline{-2ax^2+2ax} \\ ax-a^3 \\ \underline{ax-a^3} \\ 0 \end{array}$$

16 Divide $2z^3-19z^2+26z-17$ by $z-8$

$$\begin{array}{r} z-8 \overline{) 2z^3-19z^2+26z-17} \\ \underline{2z^3-16z^2} \\ -3z^2+26z \\ \underline{-3z^2+24z} \\ 2z-17 \\ \underline{2z-16} \\ 1 \text{ remainder} \end{array}$$

17 Divide x^6-1 by $x-1$

$$\begin{array}{r} x-1 \overline{) x^6-1} \\ \underline{x^6-x^5} \\ x^5-x^4 \\ \underline{x^5-x^4} \\ x^4-x^3 \\ \underline{x^4-x^3} \\ x^3-x^2 \\ \underline{x^3-x^2} \\ x^2-x \\ \underline{x^2-x} \\ x-1 \\ \underline{x-1} \\ 0 \end{array}$$

18 Divide $4x^4-9x^2+6x-3$ by $2x^2+3x-1$

$$\begin{array}{r} 2x^2+3x-1 \overline{) 4x^4-9x^2+6x-3} \\ \underline{4x^4+6x^3-2x^2} \\ -6x^3-7x^2+6x \\ \underline{-6x^3-9x^2+3x} \\ 2x^2+3x-3 \\ \underline{2x^2+3x-1} \\ 2 \end{array}$$

19

Divide $a^4+4a^2b+3b^4$ by $a+2b$

$$\begin{array}{r} a+2b \overline{) a^4+4a^2b+3b^4} \\ \underline{a^4+2a^3b} \\ -2a^3b+4a^2b \\ \underline{-2a^3b-4a^2b} \\ 8a^2b+3b^4 \\ \underline{8a^2b+16ab} \\ -16ab+3b^4 \\ \underline{-16ab+32b^3} \\ 3b^4-32b^3 \text{ remainder} \\ \underline{3b^4-32b^3} \\ 0 \end{array}$$

Compound Divisors

20 Divide $x^4 - a^2x^2 + 2a^3x - a^4$ by $x^2 - ax + a^2$ Ans

$$\begin{array}{r} x^2 - ax + a^2 \overline{) x^4 - a^2x^2 + 2a^3x - a^4} \\ \underline{x^4 - ax^3 + a^2x^2} \\ ax^3 - 2a^2x^2 + 2a^3x \\ \underline{ax^3 - a^2x^2 + a^3x} \\ -a^2x^2 + a^3x - a^4 \\ \underline{-a^2x^2 + a^3x - a^4} \\ 0 \end{array}$$

Common Measure

Art 466. Prob 2 What is the greatest common measure of $x^3 - b^2x$ and $x^2 + 2bx + b^2$ Ans $x + b$

$$\begin{array}{r} x^3 - b^2x \overline{) x^2 + 2bx + b^2} \\ \underline{x^3 - b^2x} \\ 2b^2x + b^2 \end{array}$$

$$\begin{array}{r} x^2 + 2bx + b^2 \overline{) x^3 - b^2x} \\ \underline{x^3 + 2bx^2 + b^2x} \\ -2bx^2 - 3b^2x - b^2 \end{array}$$

$$\begin{array}{r} x^2 + 2bx + b^2 \overline{) -2bx^2 - 3b^2x - b^2} \\ \underline{-2bx^2 - 4bx^2 - 2b^2x} \\ b^2x - b^2 \end{array}$$

3 What is the greatest common measure of $cx + x^2$ and $a^2c + a^2x$

$$\begin{array}{r} cx + x^2 \overline{) a^2c + a^2x} \\ \underline{cx + x^2} \\ 0 \end{array}$$

Ans $c + x$ common measure

4 What is the greatest common measure of $3x^3 - 24x - 9$ and $2x^3 - 16x - 6$ Ans $x^3 - 8x - 3$

$$\begin{array}{r} 3 \overline{) 3x^3 - 24x - 9} \\ \underline{x^3 - 8x - 3} \end{array}$$

$$\begin{array}{r} 2 \overline{) 2x^3 - 16x - 6} \\ \underline{x^3 - 8x - 3} \end{array}$$

5 What is the greatest common measure of $a^4 - b^4$ and $a^5 - b^5$ Ans $a^2 - b^2$

$$\begin{array}{r} a^4 - b^4 \overline{) a^5 - b^5} \\ \underline{a^5 - b^5} \\ 0 \end{array}$$

6 What is the greatest common measure of $x^2 - 1$ and $xy + y$ Ans $x + 1$

$$\begin{array}{r} x^2 - 1 \overline{) xy + y} \\ \underline{xy + y} \\ 0 \end{array}$$

7 What is the greatest common measure of $x^3 - a^3$ and $x^4 - a^4$

$$\begin{array}{r} x^3 - a^3 \overline{) x^4 - a^4} \\ \underline{x^4 - a^3x} \\ a^3x - a^4 \end{array}$$

$$\begin{array}{r} x^3 - a^3 \overline{) a^3x - a^4} \\ \underline{a^3x - a^4} \\ 0 \end{array}$$

divide by $x^4 - a^4$

$$\begin{array}{r} x^4 - a^4 \overline{) x^4 - a^3x} \\ \underline{x^4 - a^3x} \\ 0 \end{array}$$

divide by $-ax$

$$\begin{array}{r} -ax \overline{) a^3x - a^4} \\ \underline{-a^3x + a^4} \\ 0 \end{array}$$

common measure

8 What is the greatest common measure of $a^2 - ab - 2b^2$ and $a^2 - 3ab + 2b^2$ Ans $a - 2b$

$$\begin{array}{r} a^2 - ab - 2b^2 \overline{) a^2 - 3ab + 2b^2} \quad 1 \\ \underline{a^2 - ab - 2b^2} \\ -2ab + 4b^2 \\ \text{divide by } 2b \quad 2ab - 4b^2 \\ \underline{2ab - 4b^2} \\ 0 \end{array}$$

$$\begin{array}{r} a - 2b \overline{) a^2 - ab - 2b^2} \quad a + b \\ \underline{a^2 - 2ab} \\ ab - 2b^2 \\ \underline{ab - 2b^2} \\ 0 \end{array}$$

9 What is the greatest common measure of $a^4 - x^4$ and $a^3 - a^2x - ax^2 + x^3$ Ans $a^2 - x^2$

$$\begin{array}{r} a^4 - x^4 \overline{) a^3 - a^2x - ax^2 + x^3} \quad a + x \\ \underline{a^4 - a^3x - ax^3 + x^4} \\ a^3x + a^2x^2 - ax^3 - x^4 \\ \underline{a^3x + a^2x^2 - ax^3 - x^4} \\ 0 \end{array}$$

$$\begin{array}{r} a^2 - x^2 \overline{) a^4 - x^4} \quad a^2 + x^2 \\ \underline{a^4 - a^2x^2 - ax^2 + x^4} \\ a^2x^2 - ax^2 \\ \underline{a^2x^2 - ax^2} \\ 0 \end{array}$$

10 What is the greatest common measure of $a^3 - ab^2$ and $a^2 + 2ab + b^2$

$$\begin{array}{r} a^3 - ab^2 \overline{) a^2 + 2ab + b^2} \quad a - b \\ \underline{a^3 - ab^2} \\ 2a^2b + 2ab^2 \\ \underline{2a^2b + 2ab^2} \\ 0 \end{array}$$

$$\begin{array}{r} a + b \overline{) a^3 - ab^2} \quad a^2 - ab \\ \underline{a^3 + ab^2} \\ -2ab^2 \\ \underline{-2ab^2 - 2ab^2} \\ 4ab^2 \\ \underline{4ab^2} \\ 0 \end{array}$$

Evolution of Binomials

Expand into a series $(1+x)^{\frac{1}{2}}$

$$(1+x)^{\frac{1}{2}} = 1 + \frac{1}{2}x + \frac{1}{2} \times \frac{-\frac{1}{2}}{2}x^2 + \frac{1}{2} \times \frac{-\frac{1}{2}}{2} \times \frac{-\frac{3}{2}}{3}x^3 + \frac{1}{2} \times \frac{-\frac{1}{2}}{2} \times \frac{-\frac{3}{2}}{3} \times \frac{-\frac{5}{2}}{4}x^4$$

$$\frac{1}{2} \times \frac{-\frac{1}{2}}{2} = \frac{1}{2} \times \frac{-1}{4} = \frac{-1}{8}$$

$$\frac{-1}{8} \times \frac{-\frac{3}{2}}{3} = \frac{-1}{8} \times \frac{-3}{6} = \frac{3}{48}$$

$$\frac{3}{48} \times \frac{-\frac{5}{2}}{4} = \frac{3}{48} \times \frac{-5}{8} = \frac{-15}{384}$$

$$(1+x)^{\frac{1}{2}} = 1 + \frac{x}{2} - \frac{x^2}{8} + \frac{3x^3}{48} - \frac{15x^4}{384} \quad \text{Ans}$$

Evolution of Binomials

3 Expand $\sqrt{2}$ or $(1+1)^{\frac{1}{2}}$

$$(1+1)^{\frac{1}{2}} = 1^{\frac{1}{2}} + 1^{-\frac{1}{2}} + 1^{-\frac{3}{2}} + 1^{-\frac{5}{2}} + 1^{-\frac{7}{2}} + 1^{-\frac{9}{2}} + \dots$$

$$\frac{1}{2} \times \frac{1}{2} = \frac{1}{2} \times \frac{1}{4} = \frac{1}{2.4} \text{ coefficient of the third term}$$

$$-\frac{1}{2.4} \times \frac{-3}{3} = -\frac{1}{2.4} \times \frac{-3}{6} = \frac{3}{2.4.6} \quad 4^{\text{th}}$$

$$\frac{3}{2.4.6} \times \frac{-5}{5} = \frac{3}{2.4.6} \times \frac{-5}{8} = \frac{-3.5}{2.4.6.8}$$

$$-\frac{3.5}{2.4.6.8} \times \frac{-7}{7} = -\frac{3.5}{2.4.6.8} \times \frac{-7}{10} = \frac{3.5.7}{2.4.6.8.10}$$

$$(1+1)^{\frac{1}{2}} = 1 + \frac{1}{2} - \frac{1}{2.4} + \frac{3}{2.4.6} - \frac{3.5}{2.4.6.8} + \frac{3.5.7}{2.4.6.8.10}$$

4 Expand $(a+x)^{\frac{1}{2}}$ or $a^{\frac{1}{2}}x(1+\frac{x}{a})^{\frac{1}{2}}$

$$(a+x)^{\frac{1}{2}} = a^{\frac{1}{2}}x(1+\frac{x}{a})^{\frac{1}{2}} = 1^{\frac{1}{2}} + 1^{-\frac{1}{2}}\frac{x}{a} + 1^{-\frac{3}{2}}\frac{x^2}{a^2} + 1^{-\frac{5}{2}}\frac{x^3}{a^3} + 1^{-\frac{7}{2}}\frac{x^4}{a^4}$$

$$\frac{1}{2} \times \frac{-1}{2} = \frac{1}{2} \times \frac{-1}{4} = \frac{-1}{2.4}$$

$$-\frac{1}{2.4} \times \frac{-3}{3} = -\frac{1}{2.4} \times \frac{-3}{6} = \frac{3}{2.4.6} \text{ coefficients}$$

$$\frac{3}{2.4.6} \times \frac{-5}{5} = \frac{3}{2.4.6} \times \frac{-5}{8} = \frac{-3.5}{2.4.6.8}$$

$$a^{\frac{1}{2}}x(1+\frac{x}{a})^{\frac{1}{2}} = a^{\frac{1}{2}}x(1 + \frac{x}{a} - \frac{x^2}{2.4a^2} + \frac{3x^3}{2.4.6a^3} - \frac{3.5x^4}{2.4.6.8a^4} \text{ Ans}$$

5 Expand $(a+b)^{\frac{1}{3}}$ or $a^{\frac{1}{3}}x(1+\frac{b}{a})^{\frac{1}{3}}$

$$(a+b)^{\frac{1}{3}} = a^{\frac{1}{3}}x(1+\frac{b}{a})^{\frac{1}{3}} = 1^{\frac{1}{3}} + 1^{-\frac{2}{3}}\frac{b}{a} + 1^{-\frac{5}{3}}\frac{b^2}{a^2} + 1^{-\frac{8}{3}}\frac{b^3}{a^3} + 1^{-\frac{11}{3}}\frac{b^4}{a^4}$$

$$\frac{1}{3} \times \frac{-2}{3} = \frac{1}{3} \times \frac{-2}{6} = \frac{-2}{3.6}$$

$$-\frac{2}{3.6} \times \frac{-5}{5} = -\frac{2}{3.6} \times \frac{-5}{9} = \frac{2.5}{3.6.9}$$

$$\frac{2.5}{3.6.9} \times \frac{-8}{8} = \frac{2.5}{3.6.9} \times \frac{-8}{12} = \frac{-2.5.8}{3.6.9.12}$$

$$a^{\frac{1}{3}}x(1+\frac{b}{a})^{\frac{1}{3}} = a^{\frac{1}{3}}x(1 + \frac{b}{a} - \frac{2b^2}{3.6a^2} + \frac{2.5b^3}{3.6.9a^3} - \frac{2.5.8b^4}{3.6.9.12a^4} \text{ Ans}$$

6 Expand into a series $(a-b)^{\frac{1}{4}}$

$$(a-b)^{\frac{1}{4}} = a^{\frac{1}{4}}x(1-\frac{b}{a})^{\frac{1}{4}} = 1^{\frac{1}{4}} - 1^{-\frac{3}{4}}\frac{b}{a} + 1^{-\frac{7}{4}}\frac{b^2}{a^2} - 1^{-\frac{11}{4}}\frac{b^3}{a^3} + 1^{-\frac{15}{4}}\frac{b^4}{a^4}$$

$$\frac{1}{4} \times \frac{-3}{4} = \frac{1}{4} \times \frac{-3}{8} = \frac{-3}{4.8}$$

$$-\frac{3}{4.8} \times \frac{-7}{7} = -\frac{3}{4.8} \times \frac{-7}{12} = \frac{3.7}{4.8.12}$$

$$\frac{3.7}{4.8.12} \times \frac{-11}{11} = \frac{3.7}{4.8.12} \times \frac{-11}{16} = \frac{-3.7.11}{4.8.12.16}$$

$$a^{\frac{1}{4}}x(1-\frac{b}{a})^{\frac{1}{4}} = a^{\frac{1}{4}}x(1 - \frac{b}{a} + \frac{3b^2}{4.8a^2} - \frac{3.7b^3}{4.8.12a^3} + \frac{3.7.11b^4}{4.8.12.16a^4}$$

Evolution of

7 Expand $(a+x)^{-\frac{1}{2}}$

$$(a+x)^{-\frac{1}{2}} = a^{-\frac{1}{2}} \left(1 + \frac{x}{a}\right)^{-\frac{1}{2}} = 1^{-\frac{1}{2}} + 1^{-\frac{3}{2}} \frac{x}{a} + 1^{-\frac{5}{2}} \frac{x^2}{a^2} + 1^{-\frac{7}{2}} \frac{x^3}{a^3} + 1^{-\frac{9}{2}} \frac{x^4}{a^4}$$

$$-\frac{1}{2} \times \frac{-3}{2} = -\frac{1}{2} \times \frac{-3}{4} = \frac{3}{8}$$

$$\frac{3}{2.4} \times \frac{-5}{2} = \frac{3}{2.4} \times \frac{-5}{6} = -\frac{3.5}{2.4.6}$$

$$-\frac{3.5}{2.4.6} \times \frac{-7}{4} = -\frac{3.5}{2.4.6} \times \frac{-7}{8} = \frac{3.5.7}{2.4.6.8}$$

$$a^{-\frac{1}{2}} \left(1 + \frac{x}{a}\right)^{-\frac{1}{2}} = a^{-\frac{1}{2}} \left(1 - \frac{x}{2a} + \frac{3x^2}{8a^2} - \frac{5x^3}{16a^3} + \frac{3.5.7x^4}{2.4.6.8a^4}\right) \text{ Ans}$$

8 Expand $(1-x)^{\frac{2}{5}}$

$$(1-x)^{\frac{2}{5}} = 1^{\frac{2}{5}} - 1^{-\frac{3}{5}}x + 1^{-\frac{8}{5}}x^2 - 1^{-\frac{13}{5}}x^3 + 1^{-\frac{18}{5}}x^4$$

$$\frac{2}{5} \times \frac{-3}{5} = \frac{2}{5} \times \frac{-3}{10} = -\frac{2.3}{5.10}$$

$$\frac{2.3}{5.10} \times \frac{-8}{5} = \frac{2.3}{5.10} \times \frac{-8}{15} = -\frac{2.3.8}{5.10.15}$$

$$-\frac{2.3.8}{5.10.15} \times \frac{-13}{4} = -\frac{2.3.8}{5.10.15} \times \frac{-13}{20} = \frac{2.3.8.13}{5.10.15.20}$$

$$(1-x)^{\frac{2}{5}} = 1 - \frac{2x}{5} - \frac{2.3x^2}{5.10} - \frac{2.3.8x^3}{5.10.15} - \frac{2.3.8.13x^4}{5.10.15.20} \text{ Ans}$$

9 Expand $(1+x)^{-\frac{1}{3}}$

$$(1+x)^{-\frac{1}{3}} = 1^{-\frac{1}{3}} + 1^{-\frac{4}{3}}x + 1^{-\frac{7}{3}}x^2 + 1^{-\frac{10}{3}}x^3 + 1^{-\frac{13}{3}}x^4$$

$$-\frac{1}{3} \times \frac{-4}{3} = -\frac{1}{3} \times \frac{-4}{9} = \frac{4}{27}$$

$$\frac{4}{3.10} \times \frac{-7}{3} = \frac{4}{3.10} \times \frac{-7}{15} = -\frac{4.7}{3.10.15}$$

$$-\frac{4.7}{3.10.15} \times \frac{-10}{4} = -\frac{4.7}{3.10.15} \times \frac{-10}{20} = \frac{4.7.10}{3.10.15.20}$$

$$(1+x)^{-\frac{1}{3}} = 1 + \frac{x}{3} + \frac{6x^2}{5.10} - \frac{6.11x^3}{5.10.15} + \frac{6.11.16x^4}{5.10.15.20} \text{ Ans}$$

10 Expand $(a^2+x)^{-\frac{1}{2}}$

Substituting b for a^2

$$(b+x)^{-\frac{1}{2}} = b^{-\frac{1}{2}} + b^{-\frac{3}{2}}x + b^{-\frac{5}{2}}x^2 + b^{-\frac{7}{2}}x^3$$

$$-\frac{1}{2} \times \frac{-3}{2} = -\frac{1}{2} \times \frac{-3}{4} = \frac{3}{8}$$

$$\frac{3}{2.4} \times \frac{-5}{2} = \frac{3}{2.4} \times \frac{-5}{6} = -\frac{3.5}{2.4.6}$$

$$(a^2+x)^{-\frac{1}{2}} = \frac{1}{a} - \frac{x}{2a^3} + \frac{3x^2}{2.4a^5} - \frac{3.5}{2.4.6a^7} \text{ Ans}$$

Restoring the value of a^2

Binomials Pg 11

What is the 8th power of $(a+b)$?

$$(a+b)^8 = a^8 + a^7b + a^6b^2 + a^5b^3 + a^4b^4 + a^3b^5 + a^2b^6 + ab^7 + b^8$$

$$(a+b)^8 = a^8 + 8a^7b + 28a^6b^2 + 56a^5b^3 + 70a^4b^4 + 56a^3b^5 + 28a^2b^6 + 8ab^7 + b^8$$

$$8 \times \frac{7}{2} = 28 \quad 3^{rd} \text{ coefficient}$$

Ans

$$28 \times \frac{6}{3} = 56$$

$$56 \times \frac{5}{4} = 70$$

$$70 \times \frac{4}{5} = 56$$

$$56 \times \frac{3}{6} = 28$$

$$28 \times \frac{2}{4} = 8$$

2 What is the 7th power of $(a-b)$?

$$(a-b)^7 = a^7 - a^6b + a^5b^2 - a^4b^3 + a^3b^4 - a^2b^5 + ab^6 - b^7$$

$$7 \times \frac{6}{2} = 21 = 5^{th} \text{ coefficient}$$

$$21 \times \frac{5}{3} = 35$$

$$35 \times \frac{4}{4} = 35$$

$$35 \times \frac{3}{5} = 21$$

$$21 \times \frac{2}{6} = 7$$

$$a^7 - 7a^6b + 21a^5b^2 - 35a^4b^3 + 35a^3b^4 - 21a^2b^5 + 7ab^6 - b^7$$

Ans.

3 Expand into a series $\frac{1}{1-a}$ or $(1-a)^{-1}$

$$(1-a)^{-1} = 1^{-1} - 1^{-2}a + 1^{-3}a^2 - 1^{-4}a^3 + 1^{-5}a^4$$

$$(1-a)^{-1} = 1 + a + a^2 + a^3 + a^4 \text{ Ans}$$

4 Expand $\frac{h}{a-b}$ or $hx(a-b)^{-1}$

$$hx(a-b)^{-1} = a^{-1} - a^{-2}b + a^{-3}b^2 - a^{-4}b^3 + a^{-5}b^4$$

$$\text{Ans } hx\left(\frac{1}{a} + \frac{b}{a^2} + \frac{b^2}{a^3} + \frac{b^3}{a^4}\right) \text{ &c.}$$

5 Expand into a series $(a^2+b^2)^{\frac{1}{2}}$

Substituting $c+d$ for a^2+b^2

$$(c+d)^{\frac{1}{2}} = c^{\frac{1}{2}} + c^{-\frac{1}{2}}d + c^{-\frac{3}{2}}d^2 + c^{-\frac{5}{2}}d^3$$

$$\frac{1}{4} \times \frac{-\frac{1}{2}}{2} = \frac{1}{2} \times \frac{-\frac{1}{4}}{4} = \frac{-1}{8}$$

$$\frac{-1}{8} \times \frac{-\frac{3}{2}}{3} = \frac{-1}{8} \times \frac{-3}{6} = \frac{3}{48} = \frac{1}{16}$$

$$\frac{1}{4}(a^2+b^2)^{\frac{1}{2}} = a + \frac{b^2}{2a} - \frac{b^4}{8a^3} + \frac{b^6}{16a^5} \text{ Answer}$$

a^2+b^2 restored

Evolution of

6 Expand into a series $(a+y)^{-4}$

$$(a+y)^{-4} = a^{-4} + a^{-5}y + a^{-6}y^2 + a^{-7}y^3 + a^{-8}y^4$$

$$-\frac{4 \times 5}{1} = 10$$

$$\frac{10 \times 6}{2} = 20$$

$$-\frac{20 \times 7}{3} = -35 \quad (a+y)^{-4} = \frac{1}{a^4} - \frac{4y}{a^5} + \frac{10y^2}{a^6} - \frac{20y^3}{a^7} + \frac{35y^4}{a^8} \text{ Ans}$$

7 Expand into a series $(c^3+x^3)^{\frac{1}{3}}$

substituting $a+y$ for c^3+x^3

$$a^{\frac{1}{3}}(1+\frac{y}{a})^{\frac{1}{3}} = 1^{\frac{1}{3}} + \frac{1}{3} \frac{y}{a} + \frac{1}{3} \frac{y^2}{a^2} + \frac{1}{3} \frac{y^3}{a^3}$$

$$\frac{1}{3} \times \frac{1}{2} = \frac{1}{6} \times \frac{1}{2} = \frac{1}{12}$$

$$-\frac{1}{12} \times \frac{3}{2} = -\frac{1}{8} \times \frac{3}{2} = -\frac{3}{16}$$

$$(c^3+x^3)^{\frac{1}{3}} = (c^3)^{\frac{1}{3}}(1+\frac{x^3}{c^3})^{\frac{1}{3}} = c(1+\frac{x^3}{3c^3} - \frac{2x^6}{3 \cdot 6c^6} + \frac{2 \cdot 5x^9}{3 \cdot 6 \cdot 9c^9}) \text{ Ans}$$

8 Expand $\sqrt{c^2+x^2}$ or $d(c^2+x^2)^{-\frac{1}{2}}$

$$d(c^2+x^2)^{-\frac{1}{2}} = dx(c^2)^{-\frac{1}{2}}(1+\frac{x^2}{c^2})^{-\frac{1}{2}} = \frac{1}{c} + \frac{1}{c} \frac{x^2}{c^2} + \frac{1}{c} \frac{x^4}{c^4} + \frac{1}{c} \frac{x^6}{c^6} + \frac{1}{c} \frac{x^8}{c^8}$$

$$dx(c^2)^{-\frac{1}{2}} = \frac{dx}{c}$$

$$-\frac{1}{2} \times \frac{3}{2} = -\frac{3}{4} \times \frac{3}{4} = -\frac{9}{16}$$

$$\frac{3}{16} \times \frac{5}{2} = \frac{3}{16} \times \frac{5}{2} = \frac{15}{32}$$

$$-\frac{15}{32} \times \frac{7}{2} = -\frac{15}{32} \times \frac{7}{2} = -\frac{105}{64}$$

$$\frac{d}{c} \left(1 - \frac{x^2}{2c^2} + \frac{3x^4}{2 \cdot 4c^4} - \frac{3 \cdot 5x^6}{2 \cdot 4 \cdot 6c^6} + \frac{3 \cdot 5 \cdot 7x^8}{2 \cdot 4 \cdot 6 \cdot 8c^8} \right)$$

Ans

9 Find the 5th power (a^2+y^3)

$$(b+x)^5 = b^5 + 5b^4x + 10b^3x^2 + 10b^2x^3 + 5bx^4 + x^5 \text{ substituting } b+x \text{ for } a^2+y^3$$

$$\frac{5 \times 4}{2} = 10$$

$$\frac{10 \times 3}{2} = 10$$

$$\frac{10 \times 2}{2} = 10$$

$$(b+x)^5 = b^5 + 5b^4x + 10b^3x^2 + 10b^2x^3 + 5bx^4 + x^5$$

$$(a^2+y^3)^5 = a^{10} + 5a^8y^3 + 10a^6y^6 + 10a^4y^9 + 5a^2y^{12} + y^{15} \text{ Ans}$$

10 Find the 4th power of $(a+b+x)$

substituting h for $b+x$

$$(a+h)^4 = a^4 + 4a^3h + 6a^2h^2 + 4ah^3 + h^4$$

$$(a+h)^4 = a^4 + 4a^3h + 6a^2h^2 + 4ah^3 + h^4$$

$$(a+b+x)^4 = a^4 + 4a^3x(b+x) + 6a^2x(b+x)^2 + 4ax(b+x)^3 + (b+x)^4$$

Restoring $b+x$

Ans

$$\frac{4 \times 3}{2} = 6$$

$$\frac{6 \times 2}{2} = 6$$

Binomials B, W

11 Expand $(a^3 - x)^{\frac{1}{2}}$

$$(a^3 - x)^{\frac{1}{2}} = a^{\frac{3}{2}} \times (1 - \frac{x}{a^3})^{\frac{1}{2}} = 1^{\frac{1}{2}} - 1^{-\frac{1}{2}} \frac{x}{a^3} + 1^{-\frac{3}{2}} \frac{x^2}{a^6} - 1^{-\frac{5}{2}} \frac{x^3}{a^9} \text{ &c}$$

$$a^{\frac{3}{2}} (1 - \frac{x}{a^3})^{\frac{1}{2}} = a^{\frac{3}{2}} \times (1 - \frac{x}{2a^3} - \frac{x^2}{2.4a^6} - \frac{3x^3}{2.4.6a^9} \text{ &c}$$

$$\frac{1}{2} \times -\frac{1}{2} = -\frac{1}{2} \times -\frac{1}{4} = \frac{1}{8}$$

12 Expand $(1 - y^2)^{\frac{1}{2}}$ $\parallel (1 - y^2)^{\frac{1}{2}} = 1^{\frac{1}{2}} - 1^{-\frac{1}{2}} y^2 + 1^{-\frac{3}{2}} y^4 - 1^{-\frac{5}{2}} y^6 \text{ &c}$

$$\frac{1}{2} \times -\frac{1}{2} = -\frac{1}{2} \times -\frac{1}{4} = \frac{1}{8}$$

$$-\frac{1}{2.4} \times -\frac{3}{3} = -\frac{1}{2.4} \times -\frac{3}{6} = \frac{3}{2.4.6}$$

$$(1 - y^2)^{\frac{1}{2}} = 1 - \frac{y^2}{2} - \frac{y^4}{2.4} - \frac{3y^6}{2.4.6} \text{ Ans}$$

13 Expand $(a - x)^{\frac{1}{3}}$

$$(a - x)^{\frac{1}{3}} = a^{\frac{1}{3}} \times (1 - \frac{x}{a})^{\frac{1}{3}} = 1^{\frac{1}{3}} - 1^{-\frac{2}{3}} \frac{x}{a} + 1^{-\frac{5}{3}} \frac{x^2}{a^2} - 1^{-\frac{8}{3}} \frac{x^3}{a^3} \text{ &c}$$

$$\frac{1}{3} \times -\frac{2}{3} = -\frac{1}{3} \times -\frac{2}{6} = -\frac{2}{9}$$

$$-\frac{2}{3.6} \times -\frac{5}{3} = -\frac{2}{3.6} \times -\frac{5}{9} = \frac{2.5}{3.6.9}$$

$$a^{\frac{1}{3}} (1 - \frac{x}{a})^{\frac{1}{3}} = a^{\frac{1}{3}} \times (1 - \frac{x}{3a} - \frac{2x^2}{3.6a^2} - \frac{2.5x^3}{3.6.9a^3}) \text{ &c} \text{ Ans}$$

14 Expand $h(a^3 - y^3)^{\frac{1}{3}}$ $h(a^3 - y^3)^{\frac{1}{3}} = h \times (a^3)^{\frac{1}{3}} \times (1 - \frac{y^3}{a^3})^{\frac{1}{3}}$

$$h(a^3)^{\frac{1}{3}} \times (1 - \frac{y^3}{a^3})^{\frac{1}{3}} = 1^{\frac{1}{3}} - 1^{-\frac{2}{3}} \frac{y^3}{a^3} + 1^{-\frac{5}{3}} \frac{y^6}{a^6} - 1^{-\frac{8}{3}} \frac{y^9}{a^9} \text{ &c}$$

$$\frac{1}{3} \times -\frac{2}{3} = -\frac{1}{3} \times -\frac{2}{6} = -\frac{2}{9}$$

$$-\frac{2}{3.6} \times -\frac{5}{3} = -\frac{2}{3.6} \times -\frac{5}{9} = \frac{2.5}{3.6.9}$$

$$(h \times (a^3)^{\frac{1}{3}} - ha$$

$$h \times (a^3)^{\frac{1}{3}} \times (1 - \frac{y^3}{a^3})^{\frac{1}{3}} = ah \times (1 - \frac{y^3}{3a^3} - \frac{2y^6}{3.6a^6} - \frac{2.5y^9}{3.6.9a^9} \text{ &c}$$

Ans

Evolution of

3 What is the 5th root of $a^5 + 5a^4b + 10a^3b^2 + 10a^2b^3 + 5ab^4 + b^5$ Ans $a+b$

$$\begin{array}{r} 5a^4 \overline{) 5a^4b} \\ 5a^4b \end{array}$$

$a^5 + 5a^4b + 10a^3b^2 + 10a^2b^3 + 5ab^4 + b^5$ the 5th power of $a+b$

4 What is the cube root of $a^3 - 6a^2b + 12ab^2 - 8b^3$ Ans $a-2b$

$$\begin{array}{r} 3a^2 \overline{) -6a^2b} \\ -6a^2b \end{array}$$

Art 1486 3 What is the square root of $a^6 - 2a^5 + 3a^4 - 2a^3 + a^2$

$$\begin{array}{r} a^3 \overline{) a^6 - 2a^5 + 3a^4 - 2a^3 + a^2} \\ 2a^5 - 2a^4 + a^3 \overline{) 2a^4 - 2a^3 + a^2} \\ 2a^4 - 2a^3 + a^2 \end{array}$$

4 What is the square root of $a^4 + 4a^3b + 4a^2b^2 + 4ab^3 + 4b^4$ Ans $a^2 + 2b$

$$\begin{array}{r} 2a^2 + 2b \overline{) 4a^3b + 4b^4} \\ 4a^3b + 4b^4 \\ \hline 2a^2 + 2b - 2 \overline{) -4a^2 - 8b + 4} \\ -4a^2 - 8b + 4 \end{array}$$

1 Find the square root of $x^4 - 4x^3 + 6x^2 - 4x + 1$ Ans $x^2 - 2x + 1$

$$\begin{array}{r} 2x^2 - 2x \overline{) x^4 - 4x^3 + 6x^2 - 4x + 1} \\ 2x^4 - 4x^3 + 4x^2 \overline{) 2x^2 - 4x + 1} \\ 2x^4 - 4x^3 + 4x^2 \end{array}$$

2 Find the cube root of $x^6 - 6x^5 + 15x^4 - 20x^3 + 15x^2 - 6x + 1$ Ans $x^2 - 2x + 1$

$$\begin{array}{r} 3x^4 \overline{) -6x^5} \\ -6x^5 \end{array}$$

$$\begin{array}{r} 3x^4 \overline{) 3x^4} \\ 3x^4 \end{array}$$

$x^6 - 6x^5 + 15x^4 - 20x^3 + 15x^2 - 6x + 1$ found by cubing $x^2 - 2x + 1$

4 3 Find the square root of $4x^4 - 4x^3 + 13x^2 - 6x + 9$ Ans $2x^2 - x + 3$

$$\begin{array}{r} 4x^2 - x \overline{) 4x^4 - 4x^3 + 13x^2 - 6x + 9} \\ 4x^4 - 4x^3 + 4x^2 \overline{) 9x^2 - 6x + 9} \\ 9x^2 - 6x + 9 \end{array}$$

Compound Quantities.

4 Find the fourth root of $16a^4 - 96a^3x + 216a^2x^2 - 216ax^3 + 81x^4$ Ans

$$\begin{array}{r} 16a^4 - 96a^3x + 216a^2x^2 - 216ax^3 + 81x^4 \quad 2a - 3x \text{ Ans} \\ \underline{16a^4} \\ 32a^3 - 96a^3x \\ \underline{-96a^3x} \\ 16a^4 - 96a^3x + 216a^2x^2 - 216ax^3 + 81x^4 \text{ the 4th power} \end{array}$$

5 Find the 5th root of $x^5 + 5x^4 + 10x^3 + 10x^2 + 5x + 1$ Ans

$$\begin{array}{r} x^5 + 5x^4 + 10x^3 + 10x^2 + 5x + 1 \\ \underline{5x^4} \\ 5x^4 \end{array}$$

 the 5th power of $x+1 = x^5 + 5x^4 + 10x^3 + 10x^2 + 5x + 1$

6 Find the 6th root of $a^6 - 6a^5b + 15a^4b^2 - 20a^3b^3 + 15a^2b^4 - 6ab^5 + b^6$ Ans

$$\begin{array}{r} a^6 - 6a^5b + 15a^4b^2 - 20a^3b^3 + 15a^2b^4 - 6ab^5 + b^6 \\ \underline{a^6 - 6a^5b + 15a^4b^2 - 20a^3b^3 + 15a^2b^4 - 6ab^5 + b^6} \\ 2a^5 - 6a^4b + 15a^3b^2 - 20a^2b^3 + 15ab^4 - 6b^5 \\ \underline{2a^5 - 6a^4b + 15a^3b^2 - 20a^2b^3 + 15ab^4 - 6b^5} \\ 2a^5 - 6a^4b + 15a^3b^2 - 20a^2b^3 + 15ab^4 - 6b^5 \\ \underline{2a^5 - 6a^4b + 15a^3b^2 - 20a^2b^3 + 15ab^4 - 6b^5} \\ a^3 - 3a^2b + 3ab^2 - b^3 \text{ sixth root} \end{array}$$

$$\begin{array}{r} a^3 - 3a^2b + 3ab^2 - b^3 \\ \underline{3a^2b} \\ -3a^2b \end{array}$$

 $a^3 - 3a^2b + 3ab^2 - b^3$ the cube of $a-b$

Roots of Binomials surds

2 $\sqrt{a+vb} = x + \sqrt{y}$
 $\sqrt{a-vb} = x - \sqrt{y}$ Squaring

$$\begin{array}{r} a+vb = x^2 + 2x\sqrt{y} + y \\ a-vb = x^2 - 2x\sqrt{y} + y \\ \hline 2a = 2x^2 + 2y \\ a = x^2 + y \\ \sqrt{a-b} = x - \sqrt{y} \end{array}$$

$$\begin{array}{r} a + \sqrt{a-b} = 2x = x\sqrt{a+\sqrt{a-b}} \\ a - \sqrt{a-b} = 2y = \sqrt{y}\sqrt{a+\sqrt{a-b}} \end{array}$$

$$\sqrt{a+vb} = \sqrt{\frac{a+\sqrt{a-b}}{2}} + \sqrt{\frac{a-\sqrt{a-b}}{2}}$$

$$\sqrt{a+vb} = \sqrt{\frac{a+\sqrt{a-b}}{2}} - \sqrt{\frac{a-\sqrt{a-b}}{2}}$$

$$\sqrt{a+vb} = \sqrt{11+6\sqrt{2}} = \sqrt{\frac{11+6\sqrt{2}}{2}} + \sqrt{\frac{11-6\sqrt{2}}{2}}$$

$$\sqrt{11+6\sqrt{2}} = \sqrt{\frac{11+7}{2}} + \sqrt{\frac{11-7}{2}}$$

$$\sqrt{11+6\sqrt{2}} = 3 + \sqrt{2} \text{ Ans}$$

3 Roots of Binomials Surd

3 Find the square root of $6-2\sqrt{5}$ Ans $\sqrt{5}-1$

$$\sqrt{a+b} = \sqrt{a+\sqrt{a^2-b}} + \sqrt{a-\sqrt{a^2-b}}$$

$$\sqrt{a-b} = \sqrt{a+\sqrt{a^2-b}} - \sqrt{a-\sqrt{a^2-b}}$$

$$\sqrt{6-2\sqrt{5}} = \sqrt{6+\sqrt{36-20}} - \sqrt{6-\sqrt{36-20}}$$

$$\sqrt{6+2\sqrt{5}} = \sqrt{6+\frac{11}{2}} - \sqrt{6-\frac{11}{2}} =$$

$$\sqrt{6+2\sqrt{5}} = \sqrt{5} - 1 \text{ Ans}$$

4 Find the square root of $7+4\sqrt{3}$ Ans $2+\sqrt{3}$

$$\sqrt{a+b} = \sqrt{a+\sqrt{a^2-b}} + \sqrt{a-\sqrt{a^2-b}}$$

$$\sqrt{a-b} = \sqrt{a+\sqrt{a^2-b}} - \sqrt{a-\sqrt{a^2-b}}$$

$$\sqrt{7+4\sqrt{3}} = \sqrt{7+\sqrt{49-48}} + \sqrt{7-\sqrt{49-48}}$$

$$\sqrt{7+4\sqrt{3}} = \sqrt{7+1} + \sqrt{7-1}$$

$$\sqrt{7+4\sqrt{3}} = 2 + \sqrt{3} \text{ Ans}$$

5 Find the square root of $7-2\sqrt{10}$ Ans $\sqrt{5}-\sqrt{2}$

$$\sqrt{a+b} = x + \sqrt{y}$$

$$\sqrt{a-b} = x - \sqrt{y}$$

$$a+b = x^2 + 2x\sqrt{y} + y$$

$$a-b = x^2 - 2x\sqrt{y} + y$$

$$2a = 2x^2 + 2y$$

$$a = x^2 + y$$

$$\sqrt{a^2-b} = x^2 - y$$

$$a + \sqrt{a^2-b} = 2x^2 = x = \sqrt{a + \sqrt{a^2-b}}$$

$$a - \sqrt{a^2-b} = 2y = \sqrt{y} = \sqrt{a - \sqrt{a^2-b}}$$

$$\sqrt{a+b} = \sqrt{a + \sqrt{a^2-b}} + \sqrt{a - \sqrt{a^2-b}}$$

$$\sqrt{a-b} = \sqrt{a + \sqrt{a^2-b}} - \sqrt{a - \sqrt{a^2-b}}$$

$$\sqrt{7-2\sqrt{10}} = \sqrt{7+\sqrt{49-40}} - \sqrt{7-\sqrt{49-40}}$$

$$\sqrt{7-2\sqrt{10}} = \sqrt{7+3} - \sqrt{7-2}$$

$$\sqrt{7-2\sqrt{10}} = \sqrt{5} - \sqrt{2} \text{ Ans}$$

$$\begin{array}{l} \sqrt{a+b} = x + \sqrt{y} \\ \sqrt{a-b} = x - \sqrt{y} \\ \hline \sqrt{a^2-b} = \frac{x^2 - y}{x} \end{array}$$

Art. 489. $1 + \sqrt{1+x} = 1 + \frac{x}{2} - \frac{x^2}{8} + \frac{x^3}{16} - \frac{5x^4}{128}$

$$\begin{array}{r} 2 + \frac{x}{2} \overline{) 1 + \sqrt{1+x}} \\ \underline{2 + x} \\ -x + \frac{x^2}{4} \\ \underline{-x + \frac{x^2}{4}} \\ \frac{x^2}{4} - \frac{x^3}{8} + \frac{x^4}{16} \\ \underline{-\frac{x^2}{4} + \frac{x^3}{8} - \frac{x^4}{16}} \\ \frac{x^3}{8} - \frac{x^4}{16} + \frac{x^5}{64} - \frac{x^6}{256} \\ \underline{-\frac{x^3}{8} + \frac{x^4}{16} - \frac{x^5}{64} + \frac{x^6}{256}} \\ \frac{x^4}{16} - \frac{x^5}{64} + \frac{x^6}{256} - \frac{x^7}{1024} \end{array}$$

3

Expand into a series $\frac{1+2x}{1-x-x^2}$

Assume $\frac{1+2x}{1-x-x^2} = A + Bx + Cx^2 + Dx^3 + \dots$
 $ \phantom{\frac{1+2x}{1-x-x^2}} = A + Bx + Cx^2 + Dx^3 + \dots$
 $ \phantom{\frac{1+2x}{1-x-x^2}} - Ax - Bx^2 - Cx^3 - Dx^4 - \dots$
 $ \phantom{\frac{1+2x}{1-x-x^2}} = 1 - 2x - 16x^2 - 16x^3 - 16x^4 - \dots$

$A - 1 = 0$ $0 = (A-1)Bx - (A-2)Cx + (B-1)Dx^2 - (C-1)Ex^3 + \dots$

$A = 1$ $Bx - Ax - 2x = 0$
 $B - 1 - 2 = 0$

$B = 1 + 2$

$x^2 / Cx^2 - Bx^2 - Ax^2 = 0$
 $C - B - A = 0$

$C = B + A$

$x^3 / Dx^3 - Cx^3 - Bx^3 = 0$
 $D - C - B = 0$

$D = C + B$

$\frac{1-2x}{1-x-x^2} = 1 + 3x + 4x^2 + 7x^3 + \dots$

Ans

4 Expand into a series $\frac{d}{b-ax}$

$\frac{d}{b-ax} = \frac{d}{b} \left(\frac{1}{1-\frac{ax}{b}} \right) = A + Bx + Cx^2 + Dx^3 + \dots$

$\phantom{\frac{d}{b-ax}} = A + Bx + Cx^2 + Dx^3 + \dots$
 $\phantom{\frac{d}{b-ax}} - \frac{a}{b} Ax - \frac{a}{b} Bx^2 - \frac{a}{b} Cx^3 - \frac{a}{b} Dx^4 - \dots$

$0 = (A-1)Bx - (A-\frac{a}{b})Cx + (B-\frac{a}{b})Dx^2 - (C-\frac{a}{b})Ex^3 + \dots$

$A - 1 = 0$

$A = 1$ $Bx - Aax = 0$
 $B - \frac{a}{b}A = 0$

$B = \frac{a}{b}A$

$C - \frac{a}{b}B = 0$

$C = \frac{a}{b}B$

$D - \frac{a}{b}C = 0$

$D = \frac{a}{b}C$

$\frac{d}{b} \left(\frac{1}{1-\frac{ax}{b}} \right) = \frac{d}{b} \left(1 + \frac{a}{b}x + \frac{a^2}{b^2}x^2 + \frac{a^3}{b^3}x^3 + \dots \right)$

Answer

$$2 \left\{ \begin{array}{l} 24 \\ 16 \end{array} : 3 :: 384 : 12 \right.$$

$$3 \left\{ \begin{array}{l} 24 \\ 16 \end{array} : 4 :: 96 : 3 \right.$$

$$4 \left\{ \begin{array}{l} 84 \\ 5 \end{array} : 7 :: 100 : 20 \right.$$

$$5 \left\{ \begin{array}{l} 84 \\ 20 \end{array} : 12 :: 100 : 5 \right.$$

$$6 \left\{ \begin{array}{l} 2026 \\ 40 \end{array} : 40 :: 6060 : 20 \right.$$

$$7 \left\{ \begin{array}{l} 200 \\ 12 \end{array} : 22 = 6 :: 300 : 5 \right.$$

$$2 \cdot 2.5 \times 17.3 \times 12.3 \times 6 \times 10.25 : 2.5 :: 45 \times 346 \times 12.3 \times 8.2 \times 9 : 12$$

$$1 \left\{ \begin{array}{l} 12 \\ 8 \end{array} : 10 :: 24 : 120 \right.$$

$$2 \left\{ \begin{array}{l} 450 \\ 5 \end{array} : 18 :: 2500 : 28 \right.$$

$$3 \left\{ \begin{array}{l} 12 \\ 5 \end{array} : 2.5 \right.$$

$$108 : 100 :: 125 : 118.70$$

$$4 \left\{ \begin{array}{l} 3 \\ 5 \end{array} : 1 :: 45 : 12 \right.$$

$$5 \left\{ \begin{array}{l} 240 \\ 16 \end{array} : 12 :: 420 : 27 \right.$$

$$6 \left\{ \begin{array}{l} 16.5 \\ 1.5 \end{array} : 125 : 36 : 177.27 \right.$$

$$7 \left\{ \begin{array}{l} 4 \\ 8 \end{array} : 1 :: 1 \right.$$

$$8 \left\{ \begin{array}{l} 18 \\ 6 \end{array} : 3 :: 1 \right.$$

$$9 \left\{ \begin{array}{l} 200 \\ 6 \end{array} : 80 :: 1 \right.$$

$$10 \left\{ \begin{array}{l} 9 \\ 5 \end{array} : 450 \right.$$

$$11 \left\{ \begin{array}{l} 8 \\ 1 \end{array} : 2.375 :: 1 \right.$$

$$12$$

$$\frac{5}{4} \mid \frac{120}{6} \mid \frac{1-a}{9} \mid 17 \mid \frac{18}{5}$$

$$\frac{9}{6} \mid \frac{10}{4} \mid \frac{2}{5} \mid 11 \mid 9 \mid \frac{12}{7} \text{ ans}$$

$$\frac{13}{4} \mid \frac{14}{9} \mid \frac{13}{7} \mid 16 \mid 1 \text{ ans}$$

$$\frac{17}{4} \mid \frac{18}{7} \mid 19 \mid 21$$

$$\frac{20}{2} \text{ ans}$$

Infinite Series

5 Expand into a series $\frac{1-x}{1-2x-3x^2}$

$$\frac{1-x}{1-2x-3x^2} = A + Bx + Cx^2 + Dx^3 + Ex^4 + \dots$$

$$\begin{array}{r} 1-x \\ 1-2x-3x^2 \end{array} = \begin{array}{r} A + Bx + Cx^2 + Dx^3 + Ex^4 + \dots \\ - (A + Bx + Cx^2 + Dx^3 + Ex^4 + \dots) \\ \hline -1 + x - 3Ax^2 - 3Bx^3 - 3Cx^4 - 3Dx^5 - 3Ex^6 \end{array}$$

$$0 = A - 1 + (B - 2A)x + (C - 3A)x^2 + (D - 3B)x^3 + (E - 3C)x^4 + \dots$$

$$\begin{array}{l|l|l|l} A-1=0 & B-2A=0 & C-3A=0 & D-3B=0 \\ A=1 & B=2A=2 & C=3A=3 & D=3B=6 \end{array}$$

$$\frac{1-x}{1-2x-3x^2} = 1 + 2x + 3x^2 + 6x^3 + 12x^4 + \dots$$

6 Expand into a series $\frac{1}{1-x-x^2+x^3}$

$$\text{Assume } \frac{1}{1-x-x^2+x^3} = A + Bx + Cx^2 + Dx^3 + Ex^4 + \dots$$

$$\begin{array}{r} 1 \\ 1-x-x^2+x^3 \end{array} = \begin{array}{r} A + Bx + Cx^2 + Dx^3 + Ex^4 + \dots \\ - (A + Bx + Cx^2 + Dx^3 + Ex^4 + \dots) \\ \hline -1 + x - Cx^2 - Dx^3 - Ex^4 - \dots \\ + (A + Bx + Cx^2 + Dx^3 + Ex^4 + \dots) \\ \hline -1 + x - Cx^2 - Dx^3 - Ex^4 + Ax^3 + Bx^4 + \dots \end{array}$$

$$0 = (A-1) + (B-1)x + (C-1)x^2 + (D-1)x^3 + (E-1)x^4 + \dots$$

$$\begin{array}{l|l|l|l} A-1=0 & B-1=0 & C-1=0 & D-1=0 \\ A=1 & B=1 & C=1 & D=1 \end{array}$$

$$\frac{1}{1-x-x^2+x^3} = 1 + x + x^2 + x^3 + x^4 + \dots$$

Ans

7 Expand into a series $\frac{a}{1-bx}$

$$\frac{a}{1-bx} = A + Bx + Cx^2 + Dx^3 + Ex^4 + \dots$$

$$\begin{array}{r} a \\ 1-bx \end{array} = \begin{array}{r} A + Bx + Cx^2 + Dx^3 + Ex^4 + \dots \\ - (A + Bx + Cx^2 + Dx^3 + Ex^4 + \dots) \\ \hline a - A - Bx - Cx^2 - Dx^3 - Ex^4 - \dots \end{array}$$

$$0 = (A-a) + (B-Ab)x + (C-Ab^2)x^2 + (D-Ab^3)x^3 + (E-Ab^4)x^4 + \dots$$

$$\begin{array}{l|l|l|l} A-a=0 & B-Ab=0 & C-Ab^2=0 & D-Ab^3=0 \\ A=a & B=Ab & C=Ab^2 & D=Ab^3 \end{array}$$

$$\frac{a}{1-bx} = a + abx + ab^2x^2 + ab^3x^3 + ab^4x^4 + \dots$$

Ans

8 Infinite Series

8 Expand $\frac{1-x}{1-5x+6x^2}$

$$\frac{1-x}{1-5x+6x^2} = A + Bx + Cx^2 + Dx^3 + Ex^4 + \dots$$

$$-1 - 5Ax - 5Bx^2 - 5Cx^3 - 5Dx^4 + \dots$$

$$x + 6Ax^2 + 6Bx^3 + 6Cx^4 + \dots$$

$$0 = (A-1) + (B-5A+x) + (Cx^2-5Bx^2+6Ax^2) + \dots$$

$$A-1=0 \quad x|Bx-5Ax+x=0 \quad x^2|Cx^2-5Bx^2+6Ax^2=0$$

$$A=1 \quad B-5A+1=0 \quad C-5B+6A=0$$

$$B=5A-1 \quad C=5B-6A$$

$$\frac{1-x}{1-5x+6x^2} = 1 + 4x + 14x^2 + \dots \text{Ans}$$

9. Expand $\frac{a+bx}{(1-dx)^2}$

$$\frac{a+bx}{(1-dx)^2} = A + Bx + Cx^2 + Dx^3 + \dots$$

$$-2Adx - 2Bdx^2 - 2Cdx^3 + \dots$$

$$-a - bx + Ad^2x^2 + Bd^2x^3 + \dots$$

$$\frac{1-dx}{1-2dx+d^2x^2} \quad 0 = (A-a) + (B-2Ad-bx) + (Cx^2-2Bdx^2+Ad^2x^2) + \dots$$

$$A-a=0 \quad x|Bx-2Ad-bx=0 \quad x^2|Cx^2-2Bdx^2+Ad^2x^2=0$$

$$A=a \quad B-2Ad-b=0 \quad C-2Bd+Ad^2=0$$

$$B=2Ad+b \quad C=2Bd-Ad^2$$

$$\frac{a+bx}{(1-dx)^2} = a + (2ad+b)x + (4ad+2bd-ad^2)x^2 + \dots \text{Ans}$$

10 Expand $\frac{1+x}{(1-x)^3}$

$$\frac{1+x}{(1-x)^3} = A + Bx + Cx^2 + Dx^3 + \dots$$

$$-3Ax - 3Bx^2 - 3Cx^3 + \dots$$

$$3Ax^2 + 3Bx^3 + \dots$$

$$\frac{1-x}{1-2x+x^2} \quad 0 = (A-1) + (B-3A-x) + (Cx^2-3Bx^2+3Ax^2) + (Dx^3-3Cx^3+3Bx^3) + \dots$$

$$\frac{1-2x+x^2}{1-2x+x^2} \quad x|Bx-3Ax-x=0 \quad x^2|Cx^2-3Bx^2+3Ax^2=0$$

$$A-1=0 \quad B-3A-1=0 \quad C-3B+3A=0$$

$$A=1 \quad B=3A+1 \quad C=3B-3A$$

$$x^3|Dx^3-3Cx^3+3Bx^3-Ax^3=0$$

$$D-3C+3B-A=0$$

$$D=3C-3B+A$$

$$\frac{1+x}{(1-x)^3} = 1 + 4x + 9x^2 + 16x^3 + \dots$$

Ans

Infinite Series

3 What is the sum of the infinite series
 $S = \frac{1 \cdot 3}{1 \cdot 1} = \frac{3 \times 1}{2} = \frac{3}{2}$ Ans $1 + \frac{1}{3} + \frac{1}{9} + \frac{1}{27} + \frac{1}{81} \dots$

Art. 493, 4. What is the sum of the infinite series
 $\frac{1}{1 \cdot 2 \cdot 3} + \frac{1}{2 \cdot 3 \cdot 4} + \frac{1}{3 \cdot 4 \cdot 5} + \frac{1}{4 \cdot 5 \cdot 6} \dots$

$$S = \frac{1}{2} + \frac{1}{6} + \frac{1}{12} + \frac{1}{20} \dots$$

$$S - \frac{1}{2} = \frac{1}{6} + \frac{1}{12} + \frac{1}{20} + \frac{1}{30} \dots$$

$$\frac{1}{2} = \frac{1}{1 \cdot 2 \cdot 3} + \frac{1}{2 \cdot 3 \cdot 4} + \frac{1}{3 \cdot 4 \cdot 5} + \frac{1}{4 \cdot 5 \cdot 6} \dots \text{by subtraction.}$$

or $\frac{1}{4} = \frac{1}{1 \cdot 2 \cdot 3} + \frac{1}{2 \cdot 3 \cdot 4} + \frac{1}{3 \cdot 4 \cdot 5} + \frac{1}{4 \cdot 5 \cdot 6} \dots$
 Ans

2 What is the sum of the infinite series
 $1 + 3x + 4x^2 + 4x^3 + 11x^4 + 18x^5 + 29x^6 \dots$

Let $S = A + B + C + D + E \dots$ & sup $m+n$ the relation

$$C = Bmx + Anx^2$$

$$D = Cmx + Bnx^2$$

$$E = Dmx + Cnx^2$$

$$S = A + B + (Bmx + Anx^2) + (Cmx + Bnx^2) + Dmx + Cnx^2$$

$$S = A + B + C \dots$$

$$S - A = B + C + D \dots$$

$$S = A + B + (Dmx + Anx) + Snx^2$$

$$1 - mx - nx^2 \mid S - Smx - Snx^2 = A + B - Amx$$

$$S = \frac{A+B-Amx}{1-mx-nx^2}$$

$$S = \frac{1+3x-x}{1-x-x^2} = \frac{1+2x}{1-x-x^2} \text{ Ans}$$

3 What is the sum of the infinite series
 $1 + x + 5x^2 + 13x^3 + 41x^4 + 121x^5 + 365x^6 \dots$

Let $S = A + B + C + D \dots$

$$C = Bmx + Bnx^2$$

$$D = Cmx + Bnx^2$$

$$S = A + B \dots$$

$$S = A + B + (Dmx - Amx) + Dnx^2$$

$$S - A = B + C \dots 1 - mx - nx^2 \mid S - Smx - Snx^2 = A + B - Amx$$

$$S = \frac{A+B-Amx}{1-mx-nx^2}$$

Infinite Series

$$C = Bm + An \times B = Bb = Bb_m + Ab_n$$

$$D = b_m + Bn \times A = Ad = Ab_m + Ab_n$$

$$Bb - Ad = (Bb_m + Ab_n) - (Ab_m + Ab_n)$$

$$m = \frac{5 - 13 - 8}{1 - 5} = -2$$

$$Ab + Bb \mid Bb_m - Ab_m = Bb - Ad$$

$$m = \frac{Bb - Ad}{Bb - Ab}$$

$$C = Bm + An \times B$$

$$D = b_m + Bn \times A$$

$$Bb = Bb_m + Ab_n$$

$$Ad = Ab_m + Ab_n$$

$$Bb - Ad = Ab_n - Ab_m$$

$$Ab_b \mid Ab_m \quad Bb_n \times Bb_m = Bb - Ad$$

$$n = \frac{Bb - Ad}{Ab - Bb}$$

$$n = \frac{25 - 1 \times 13}{5 - 1} = \frac{12}{4} = 3$$

$$Ab - Bb$$

$$S = \frac{1 - x}{1 - 2x - 3x^2}$$

Ans

What is the sum of the infinite series
 $1 + 2x + 3x^2 + 4x^3 + 5x^4 + \dots$

Let $S = A + B + C + D$ be the sum of the series

$$C = Bm + An \times B$$

$$D = b_m + Bn \times A$$

$$S = A + B + (Bm + An \times B) + (b_m + Bn \times A)$$

$$S = A + B$$

$$S - A = B$$

$$S = A + B + (Sm + An \times B) + (Sn \times A)$$

$$1 - mx - nx^2 \mid S - Sm - Sn \times A = A + B - An \times B$$

$$S = \frac{A + B - An \times B}{1 - mx - nx^2}$$

$$m = \frac{Db - Bb}{Bb - Bb} = \frac{4 \times 3 - 2 \times 5}{9 - 2 \times 4} = \frac{2}{1} = 2$$

$$n = \frac{Bb - Bb}{Bb - Bb} = \frac{3 \times 5 - 16}{9 - 2 \times 4} = -\frac{1}{1} = -1$$

$$S = \frac{1 + 2x - 2x}{1 - 2x + x^2} = \frac{1}{(1-x)^2} \text{ Ans}$$

Of Infinite Series

5 What is the sum of the infinite series
 $1 + 3x + 5x^2 + 7x^3 + 9x^4 + 11x^5 \dots$

Let $S = A + B + C + D \dots$ Sup $m+n$ the relation

$$C = Bm + An^2$$

$$D = Cm + Bn^2$$

$$S = A + B + (Bm + An^2) + (Cm + Bn^2)$$

$$S = A + B + \dots$$

$$S - A = B + C + \dots$$

$$S = A + B + (Sm - Am) + (Sn^2)$$

$$1 - m - n^2 \mid S - Sm - Sn^2 = A + B - Am$$

$$S = \frac{A + B - Am}{1 - m - n^2}$$

$$m = \frac{5C - BE}{6C - BS} = \frac{7 \times 5 - 3 \times 9}{25 - 3 \times 7} = \frac{8}{4} = 2$$

$$n = \frac{6E - DS}{6C - BS} = \frac{5 \times 9 - 4 \times 9}{25 - 3 \times 7} = \frac{-4}{4} = -1$$

$$S = \frac{1 + 3x - 2x}{1 - 2x + x^2} = \frac{1 + x}{(1 - x)^2} \text{ Ans}$$

6 What is the sum of the infinite series
 $1 + 2x + 8x^2 + 28x^3 + 100x^4 \dots$

Let $S = A + B + C + D \dots$ Sup $m+n$ the relation

$$C = Bm + An^2$$

$$D = Cm + Bn^2$$

$$S = A + B + (Bm + An^2) + (Cm + Bn^2)$$

$$S = A + B + \dots$$

$$S - A = B + C + \dots \mid S = A + B + (Sm - Am) + (Sn^2)$$

$$S - A = B + C + \dots \mid 1 - m - n^2 \mid S - Sm - Sn^2 = A + B - Am$$

$$S = \frac{A + B - Am}{1 - m - n^2}$$

$$m = \frac{5C - BE}{6C - BS} = \frac{28 \times 8 - 2 \times 100}{64 - 2 \times 28} = \frac{24}{8} = 3$$

$$n = \frac{6E - DS}{6C - BS} = \frac{8 \times 100 - 28 \times 28}{64 - 2 \times 28} = \frac{16}{8} = 2$$

$$S = \frac{1 + 2x - 3x}{1 - 3x - 2x^2} = \frac{1 + x}{1 - 3x - 2x^2} \text{ Ans}$$

Continued By

1 What is the sum of the infinite series

$$1 + 4x + 6x^2 + 11x^3 + 28x^4 + 63x^5 \dots$$

Let $S = A + B + C + D + E \dots$ the sum $m+n+r$ the scale

$$D = Cma + Bna^2 + Axa^3$$

$$E = Dma + Cna^2 + Bxa^3$$

$$S = A + B + C + (Cma + Bna^2 + Axa^3) + (Dma + Cna^2 + Bxa^3)$$

$$S = A + B \dots$$

$$S - A = B + C \dots$$

$$S - A - B = C + D$$

$$S = A + B + C + (Dma - Ama - Bma) + (Dna^2 - Ana^2) + (Dxa^3 - Axa^3)$$

$$1 - ma - na^2 - xa^3 \mid S - Ama - Ana^2 - Axa^3 = A + B + C - Ama - Bma - Cna^2$$

$$S = \frac{A + B + C - Ama - Bma - Cna^2}{1 - ma - na^2 - xa^3}$$

$$S = \frac{1 + 4x + 6x^2 - x - 8x^2 + x^2}{1 - 2x + x^2 - 3x^3} = \frac{1 + 3x + x^2 - 2x^2}{1 - 2x + x^2 - 3x^3} = \frac{(1+x)^2 - 2x^2}{(1-x)^2 - 3x^3} \text{ Ans}$$

2 What is the sum of the infinite series

$$1 + x + 2x^2 + 2x^3 + 3x^4 + 3x^5 + 4x^6 + 4x^7 \dots$$

Let $S = A + B + C + D + E \dots$

$$D = Cma + Bna^2 + Axa^3$$

$$E = Dma + Cna^2 + Bxa^3$$

$$S = A + B + C + (Cma + Bna^2 + Axa^3) + (Dma + Cna^2 + Bxa^3)$$

$$S = A + B \dots$$

$$S - A = B + C \dots$$

$$S - A - B = C + D$$

$$S = A + B + C + (Dma - Ama - Bma) + (Dna^2 - Ana^2) + (Dxa^3 - Axa^3)$$

$$1 - ma - na^2 - xa^3 \mid S - Ama - Ana^2 - Axa^3 = A + B + C - Ama - Bma - Cna^2$$

$$S = \frac{A + B + C - Ama - Bma - Cna^2}{1 - ma - na^2 - xa^3}$$

$$S = \frac{1 + x + 2x^2 - x - x^2 - x^2}{1 - x - x^2 + x^3} = \frac{1}{1 - x - x^2 + x^3} \text{ Ans}$$

Infinite Series

Prob. 3

What is the 12th term of the series

2.	6.	12.	20.	30.	40.	$a=2$
	4.	6.	8.	10.		$D'=4$
		2.	2.	2.		$D''=2$
			0.	0.		

$$a + (n-1)D' + (n-1)\frac{n-2}{2}D''$$

$$2 + (12-1)4 + (12-1)\frac{12-2}{2} \times 2$$

$$2 + 44 + 110 = 156 \text{ Ans}$$

4 What is the 15th term of the series 1² 2² 3² 4² 5² 6² &c

1.	4.	9.	16.	25.	36.	$a=1$
	3.	5.	7.	9.	11.	$D'=3$
		2.	2.	2.	2.	$D''=2$

$$a + (n-1)D' + (n-1)\frac{n-2}{2}D''$$

$$1 + (15-1)3 + (15-1)\frac{15-2}{2} \times 2$$

$$1 + 42 + 182 = 225 \text{ Ans}$$

Art 493 Prob 5 What is the sum of 20 terms of the series 1. 3. 6. 10. 15. &c

$na + n\frac{n-1}{2}D' + n\frac{n-1}{2}\frac{n-2}{3}D''$	2.	3.	4.	5.	$a=1$
		1.	1.	1.	$D'=2$
					$D''=1$

$$20 + 20 \times \frac{20-1}{2} \times 2 + 20 \times \frac{20-1}{2} \times \frac{20-2}{3}$$

$$20 + 380 + 1140 = 1540 \text{ Ans}$$

6 What is the sum of 12 terms of the series 1⁴ 2⁴ 3⁴ 4⁴ 5⁴ 6⁴ &c

1.	16.	81.	256.	625.	1296.	$a=1$
	15.	65.	175.	369.	671.	$D'=15$
		50.	170.	194.	302.	$D''=50$
			60.	84.	108.	$D'''=60$
				24.	24.	$D''''=24$

$$na + n\frac{n-1}{2}D' + n\frac{n-1}{2}\frac{n-2}{3}D'' + n\frac{n-1}{2}\frac{n-2}{3}\frac{n-3}{4}D''' + n\frac{n-1}{2}\frac{n-2}{3}\frac{n-3}{4}\frac{n-4}{5}D''''$$

$$= 12 + 12 \times \frac{12-1}{2} \times 15 + 12 \times \frac{12-1}{2} \times \frac{12-2}{3} \times 50 + 12 \times \frac{12-1}{2} \times \frac{12-2}{3} \times \frac{12-3}{4} \times 60 + 12 \times \frac{12-1}{2} \times \frac{12-2}{3} \times \frac{12-3}{4} \times \frac{12-4}{5} \times 24$$

$$= 12 + 12 \times 11 \times 15 + 12 \times 11 \times 4 \times 50 + 12 \times 11 \times 4 \times 3 \times 60 + 12 \times 11 \times 4 \times 3 \times 2 \times 24$$

$$= 12 + 1980 + 2640 + 3960 + 1980$$

$$= 10680 \text{ Ans}$$

Equations By Wm H. McCormick

Prob. 2

What are the roots of the equation

Sup 6

$$x^3 - 8x^2 + 4x + 48 = 0$$

$$216 - 288 + 24 + 48 = 0$$

$$\frac{24}{48} - 288 = 0$$

$$x - 6 \mid x^3 - 8x^2 + 4x + 48 \mid x^2 - 2x - 8$$

$$\begin{array}{r} x^3 - 8x^2 + 4x + 48 \\ - (x^2 - 2x - 8) \\ \hline -2x^2 + 4x + 48 \\ - (-2x^2 + 4x + 48) \\ \hline 0 \end{array}$$

$$\begin{aligned} x^2 - 2x - 8 &= 0 \\ x^2 - 2x &= 8 \\ x^2 - 2x + 1 &= 9 \\ x - 1 &= \sqrt{9} = 3 \\ x &= 1 + 3 = 4 \end{aligned}$$

$$x + 2 \mid x^2 - 2x - 8 \mid x + 2$$

$$\begin{aligned} x + 2 &= 0 \\ x &= -2 \\ x &= 4 \\ x &= 6 \text{ Ans} \end{aligned}$$

3 What are the roots of the equation

Sup 1

$$x^3 - 16x^2 + 65x - 50 = 0 \mid x - 1 \mid x^3 - 16x^2 + 65x - 50 \mid x^2 - 15x + 50$$

$$1 - 16 + 65 - 50 = 0$$

$$\begin{array}{r} x^3 - 16x^2 + 65x - 50 \\ - (x^2 - 15x + 50) \\ \hline -15x^2 + 65x - 50 \\ - (-15x^2 + 15x - 75) \\ \hline 50x - 50 \\ 50x - 50 \\ \hline 0 \end{array}$$

$$\begin{aligned} x^2 - 15x &= -50 \\ x^2 - 15x + \frac{225}{4} &= \frac{225}{4} - 50 = \frac{25}{4} \\ x - \frac{15}{2} &= \pm \sqrt{\frac{25}{4}} = \pm \frac{5}{2} \\ x &= \frac{15}{2} \pm \frac{5}{2} = 10 \end{aligned}$$

$$\begin{aligned} x &= 1 \\ x &= 5 \\ x &= 10 \text{ Ans} \end{aligned}$$

$$x - 10 \mid x^2 - 15x + 50 \mid x - 5 = 0$$

4 What are the roots of the equation

Prob 6

$$x^3 + 2x^2 - 33x = 90$$

$$216 + 72 - 198 - 90 = 0$$

$$\frac{72}{12} - 288 = 0$$

$$x - 6 \mid x^3 + 2x^2 - 33x - 90 \mid x^2 + 8x + 15$$

$$\begin{array}{r} x^3 + 2x^2 - 33x - 90 \\ - (x^2 + 8x + 15) \\ \hline 8x^2 - 33x - 90 \\ - (8x^2 - 48x + 120) \\ \hline 15x - 90 \\ 15x - 90 \\ \hline 0 \end{array}$$

$$\begin{aligned} x^2 + 8x &= -15 \\ x^2 + 8x + 16 &= 16 - 15 = 1 \\ x + 4 &= \sqrt{1} = 1 \\ x &= -4 \pm 1 = -5 \end{aligned}$$

$$\begin{aligned} x + 3 &= 0 \\ x &= -3 \end{aligned}$$

$$\begin{aligned} x &= 6 \\ x &= -5 \\ x &= -3 \text{ Ans} \end{aligned}$$

5 What is a near value of the roots of the equation

$$x^3 + 9x^2 + 4x = 80 \text{ Sub } x = r + 3$$

$$\begin{aligned} x &= (r + 3)^3 = r^3 + 3r^2 \cdot 3 + 3r \cdot 3^2 + 3^3 \\ 9x^2 &= 9(r + 3)^2 = 9r^2 + 18r \cdot 3 + 9 \cdot 3^2 \\ 4x &= 4r + 4 \cdot 3 \end{aligned}$$

$$\begin{aligned} 80 - 15 \cdot 6 \cdot 25 - 56 \cdot 25 - 10 &= \\ 18.75 + 45 + 4 &= \\ -1.875 &= \\ 67.75 &= \end{aligned}$$

$$\begin{aligned} r^3 + 9r^2 + 4r + 3r^2 \cdot 3 + 18r \cdot 3 + 4 \cdot 3 - 80 &= 0 \\ 3r^3 + 18r^2 + 41r + 12 - 80 &= 0 \\ 3r^3 + 18r^2 + 41r - 68 &= 0 \end{aligned}$$

$$187.75 \mid 1.8750 \mid 0.03$$

2.5 = number tried

$$\begin{aligned} 2.5 &= \\ 2.47 &= \end{aligned}$$

Equations B. Hoff

$$\frac{80-14.068223-54.9081-9.88}{18.3027+44.46+4}$$

$$11.143677$$

$$66.7627)11.143677 \text{ } 102$$

$$2.47$$

$$\text{Ans } 2.49$$

near value

6 What is a near value of one of the roots of the equation $x^3+x^2+x=100$ Sup 4.3

$$\text{Let } x=r+z$$

$$x^3=(r+z)^3=r^3+3r^2z+3rz^2+z^3$$

$$x^2=r^2+2rz+z^2$$

$$x=r+z$$

$$r^3+3r^2z+r^2+2rz+r+z$$

$$3r^2+2r+1|3r^2z+2rz+z=100-r^3-r^2-r$$

$$z=\frac{100-r^3-r^2-r}{3r^2+2r+1}$$

$$\text{val } 100-79.507-18.47-4.3=-2.277$$

$$55.47+12.9+1$$

$$(4.33)$$

$$69.37-2.277=-0.3$$

4.27 near value

2 What is a near value of one of the roots of the equation $x^3+10x^2+5x=2600$ Sup 11.01

$$x^3=(r+z)^3=r^3+3r^2z+3rz^2+z^3$$

$$10x^2=10r^2+20rz+10z^2$$

$$5x=5r+5z$$

$$r^3+3r^2z+10r^2+20rz+5r+5z=2600$$

$$3r^2+20r+5|3r^2z+20rz+5z=2600-r^3-10r^2-5r$$

$$z=\frac{2600-r^3-10r^2-5r}{3r^2+20r+5}$$

$$2600-1334.633301-1212.2010-55.05$$

$$363.6603+220.20+5$$

$$588.8603-1884.3010-103$$

$$-1034.633301$$

$$-1212.2010$$

$$-55.05$$

$$-2601.884301$$

$$2600$$

$$-1.884301$$

$$11.01$$

11.007 near value

Ans

What are the roots of the equation $x^3+2x^2-11x=12$

Sup 3

$$9+18-33-12=0$$

$$\frac{9}{45}-\frac{33}{45}=0$$

$$x^2+5x=-4$$

$$x^2+5x+\frac{25}{4}=\frac{25}{4}-4=\frac{9}{4}$$

$$x+\frac{5}{2}=\sqrt{\frac{9}{4}}=\frac{3}{2}$$

$$x=-\frac{5}{2}-\frac{3}{2}=-4 \text{ or } -1$$

$$x=3$$

$$x=-4$$

$$x=-1$$

Ans

$$x-3|x^3+2x^2-11x-12|x^2+5x+4$$

$$x^3-3x^2$$

$$5x^2-11x$$

$$5x^2-15x$$

$$4x-12$$

$$4x-12$$

Prob 4 What are the roots of the equation
 Sup 3

$$x^4 + 4x^3 - 7x^2 - 34x - 24 = 0$$

$$81 + 108 - 63 - 102 - 24 = 0$$

$$\begin{array}{r} 81 \\ 189 \\ \hline 189 \end{array} \quad \begin{array}{r} 63 \\ -24 \\ \hline -189 \end{array} = 0$$

$$x - 3 \mid x^4 + 4x^3 - 7x^2 - 34x - 24 = 0 \quad x^3 + 7x^2 + 14x + 8 \quad \text{Sup} - 4$$

$$\begin{array}{r} x^4 + 4x^3 \\ \hline 7x^3 - 7x^2 \\ 7x^3 - 21x^2 \\ \hline 14x^2 - 34x \\ 14x^2 - 42x \\ \hline 8x - 24 \\ 8x - 24 \\ \hline 0 \end{array} \quad \begin{array}{r} x^3 + 7x^2 + 14x + 8 \\ -64 + 112 - 56 + 8 = 0 \\ 8 - 64 \\ \hline -120 - 120 = 0 \end{array}$$

$$x^2 + 3x = -2$$

$$x^2 + 3x + \frac{9}{4} = \frac{9}{4} - 2 = \frac{1}{4}$$

$$x + \frac{3}{2} = \sqrt{\frac{1}{4}} = \frac{1}{2}$$

$$x = -\frac{3}{2} \pm \frac{1}{2} = -2 \text{ or } -1$$

$$x + 4 \mid x^3 + 7x^2 + 14x + 8 \mid x^2 + 3x + 2$$

$$\begin{array}{r} x^3 + 7x^2 + 14x + 8 \\ x^3 + 4x^2 \\ \hline 3x^2 + 14x + 8 \\ 3x^2 + 12x \\ \hline 2x + 8 \\ 2x + 8 \\ \hline 0 \end{array}$$

$$\begin{array}{l} x = 3 \\ x = -4 \\ x = -2 \\ x = -1 \end{array} \quad \text{Ans}$$

8

[Faint, illegible handwritten text and mathematical scribbles]

02

8

1

3

1

8

1

Miscellaneous Questions Feb. 23rd 1845

Prob 23

Two sides of a triangle are 20 and 40 perches respectively required the third side so that the content may be just an acre Ans 23.099 or 58.876 P

$$\frac{\text{Acre}}{1} = \frac{160}{20} = 8$$

$$\sqrt{20^2 - 8^2} = \sqrt{336} = 18.33$$

$$40 - 18.33 = 21.66 +$$

$$21.66$$

$$12996$$

$$12996$$

$$2166$$

$$4332$$

$$4691556$$

$$+ 64.1556$$

$$533.3112$$

$$23.09$$

$$45 \overline{) 133}$$

$$46 \overline{) 485}$$

$$4609 \overline{) 43156}$$

$$44481$$

+

$$\frac{40}{18.33} \sqrt{58.33^2 + 8^2}$$

$$58.33$$

$$58.33$$

$$17499$$

$$17499$$

$$46664$$

$$29165$$

$$34023889$$

$$+ 64$$

$$3466.3889$$

$$25$$

$$108 \overline{) 966}$$

$$1168 \overline{) 10238}$$

$$9344$$

$$11767 \overline{) 89489}$$

$$82369$$

$$+$$

33 On 110 Acres of Statute measure in which the pole is 5 1/2 yds how many cheshire Acres where the customary pole is 6 yds and how many of Ireland where the pole in use is 7 yds Ans 92 A 1 R 24 P Cheshire 67 A 3 R 25 P

$$7 \frac{1}{2} \text{ yds} : 110 \text{ A} = 67 \frac{1}{2} = 3 = 25$$

$$6 \text{ yds} : 110 \text{ A} = 44 \frac{2}{3} = 15600$$

$$6 \text{ yds} : 110 \text{ A} = 44 \frac{2}{3} = 15600$$

$$36 \overline{) 275}$$

$$3025$$

$$158400$$

$$3025$$

$$792000$$

$$316800$$

$$475200$$

$$36 \overline{) 479160000}$$

$$133100.00$$

$$40 \overline{) 14788.88}$$

$$4069 = 28.88$$

$$92 = 1 = 28$$

44 The ellipse in Grosvenor Square London measures 840 links the longer way and 612 the shorter within the rails now the wall being 11 in. thick it is required to find what quantity of ground it encloses and how much it stands on Encloses 4 A 96 P 1760 square ft

$$\frac{14}{28} = \frac{1}{2} \text{ ft}$$

$$\frac{1}{12} = \frac{1}{3}$$

$$840 \times 7.92 = \frac{6652.80}{12} = 554.4 \text{ longer diam.}$$

$$612 \times 7.92 = \frac{4847.04}{12} = 403.92 \text{ Less}$$

$$\frac{554.4 + \frac{1}{3}}{3} = 556.733$$

$$\frac{403.92 + \frac{1}{3}}{3} = 406.253$$

$$554.4 \times 403.92 \times .7854 = \frac{175877.17}{30.25} = 5815.90$$

$$556.733 \times 406.253 \times .7854 = 177637.41$$

$$177637.41 - 175877.17 = 1760.24$$

$$\frac{406253}{416} = 976$$

$$416 - 0 = 6 \text{ Area in}$$

5 Required the dimensions of an elliptical acre with the greater and less diameters in the ratio of 3 to 2 Ans 17.48 by 11.64

$$\frac{17854}{4.7124} : 160 : 9$$

$$4.7124 \overline{) 1440.0000} \quad 305.57$$

$$\frac{305.57}{27} = 11.317$$

$$3 : 2 : 17.4$$

$$3 \overline{) 34.8} = 11.6$$

6 Three Sides of a triangular field containing 6 A 1 R 12 P are in the ratio of the three numbers 9. 8. 6. respectively Required the Sides Ans 59.029. 52.47. and 38.37 P

$$\frac{9}{6} = 1.5$$

$$\frac{8}{6} = 1.33$$

$$11.5 \times 2.5 \times 3.5 \times 5.5 = 553.4375 = 29.53$$

$$8 : 9 : 52.47$$

$$8 \overline{) 472.23} = 59.02 +$$

$$8 : 6 : 52.47$$

$$8 \overline{) 314.82} = 39.35$$

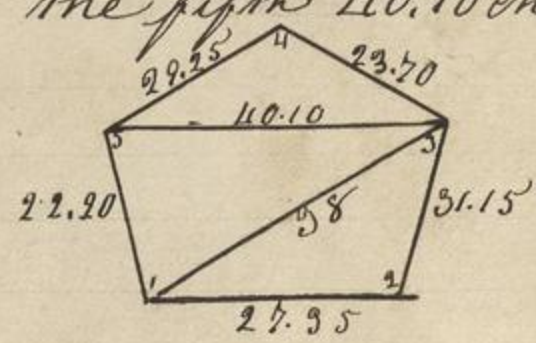
$$29.53 : 1012 : 8^2$$

$$\frac{1012}{64} = 15.8125$$

$$29.53 \overline{) 64768.00} = 2192.82$$

$$15.8125 \overline{) 18824} = 1184$$

7 In a pentangular field beginning with the south Side and measuring round towards the east the first or south Side is 27.35ch the second 31.15ch the third 23.70ch the 4th 22.25ch and the 5th 22.20ch; also the diagonal from the first angle to the 3rd is 38ch and that from the third to the fifth 40.10ch Required the area of the field Ans 117 A 2 R 39 P



$$\begin{array}{r} 27.35 \\ 31.15 \\ 38 \\ \hline 2 \overline{196.50} \text{ Sum} \\ \text{half sum } 48.25 = \text{Log. } 1.68350 \\ \text{Rem. } \left\{ \begin{array}{l} 20.90 = 1.32015 \\ 17.10 = 1.23300 \\ 10.25 = 1.01072 \end{array} \right. \\ \hline 2 \overline{15.24737} \\ \text{Ans } 10 \overline{1420.4} = 2.82968 \\ \begin{array}{r} 142 = 04 \\ \quad 4 \\ \hline 16 \\ \quad 40 \\ \hline 06.40 \end{array} \quad \begin{array}{r} 34 = 1 = 11 \\ 42 = 0 = 6 \\ 41 = 1 = 19 \\ \hline 117 = 2 = 96 \text{ Ans} \end{array} \end{array}$$

$$\begin{array}{r} 40.10 \\ 23.70 \\ 29.25 \\ \hline 2 \overline{193.05} \\ 46.525 = \\ \left\{ \begin{array}{l} 6.425 = \\ 22.825 = \\ 14.275 = \end{array} \right. \end{array}$$

$$\begin{array}{r} 22.20 \\ 38.00 \\ 40.10 \\ \hline 2 \overline{100.30} \\ 50.15 = \\ \left\{ \begin{array}{l} 27.95 = \\ 12.15 = \\ 10.05 = \end{array} \right. \\ \hline 10 \overline{413.7} \\ 41 = 37_4 \\ \begin{array}{r} 148 \\ \quad 40 \\ \hline 019.20 \end{array} \end{array}$$

8} Required the dimensions of an oblong garden
containing 3 Acres and bounded by 104 Perches of Pale fence

$$\sqrt{26^2 - 480}$$

$$\begin{array}{r} 4 \overline{) 1104} \\ \underline{26} \end{array}$$

$$\begin{array}{r} 1609 \\ \hline \end{array}$$

Ans 40 P by 12

$\sqrt{26^2 - 480}$
 $26 \div 14 = 40 \text{ by } 12$

$$\begin{array}{r} 4 \overline{) 1104} \\ \underline{26} \\ 26 \\ \underline{156} \\ 52 \\ \underline{676} \\ 480 \\ \underline{1968} \\ 14 \end{array}$$

$$\begin{array}{r} 24 \overline{) 96} \\ \underline{48} \\ 48 \end{array}$$

10} A gentleman has a garden 100 ft long and 80 broad
and a gravel walk is to be made of equal width
half round it What must be the width of the walk
so that may take up just $\frac{1}{4}$ of the ground Ans 11.8975 ft

$$\begin{array}{r}
 100 \\
 \underline{80} \\
 8000 \\
 \underline{3} \\
 424000 \\
 \underline{6000} \\
 10^6 = 100 \\
 206100 \neq 28.102
 \end{array}$$

11. A person has a garden 100 feet long and 80 broad
and a gravel walk A person has a circular yard that
is 150 ft in diameter and wishes a walk of equal width
made round it within the fence Required the width of the so
that it may occupy a fifth part of the ground Ans 7.918 ft

$150 \times 150 \times 1854 = 176715000$
 $1854 \overline{) 141372000} \quad 18000$
 $\sqrt{18000} = 134.164$
 $2 \overline{) 15.836}$
 7.918

12 From a point within a triangular field the Sides of which were equally distant I measured the distances of to the three angles and found them 12.5. 10 and 5.5 ch, respectively required the area Ans 12 A 1 R 22 P

$$\begin{array}{l}
 12.5 - 7.5 = 5 \text{ arithmetical diff} \\
 2 \overline{) 130} \\
 \text{half sum } 15 = 1.14609 \\
 \text{diff } 5 = 0.69894 \\
 \text{At } 8.90309 \\
 \text{Area } 9.12494 \\
 2 \overline{) 9.90309} \\
 \text{cos } 26.34' = 4.95154 \\
 53.8'
 \end{array}$$

$$\begin{array}{l}
 12.5 + 7.5 = 20 \\
 12.5 - 7.5 = 5 \\
 \tan 33.26' = \\
 \tan 9.22' =
 \end{array}$$

$$\begin{array}{r}
 53.8 \\
 60 \\
 \hline
 113.8 \\
 180 \\
 \hline
 316.52' \\
 33.28'
 \end{array}$$

$$\begin{array}{r}
 33.26' \\
 9.22' \\
 \hline
 42.48'
 \end{array}$$

$$\begin{array}{r}
 26.34 \\
 9.22 \\
 \hline
 35.56
 \end{array}$$

14) It is required to lay out 42 acres of land in a triangular form so that the length of one side may be 15 ch and the lengths of the other sides in the ratio of 2 to 3 What must be the lengths of those sides And 7.7914 and 11.6871 or 29.5853 and 44.3782

$$\begin{array}{l}
 \text{ratio } 3+2=5 : 15 : 3 = \frac{45}{5} = 9 \\
 9-6=3 : 9 : 6 = \frac{54}{3} = 18 \\
 \sqrt{18^2 - 6^2} = 16.961 \quad \frac{76.961}{10.039}
 \end{array}$$

$$\sqrt{10.03^2 + 6^2} = 11.68 \text{ ch} \quad \frac{15}{9} = \frac{2}{6}$$

$$\begin{array}{r}
 3 : 2 : 11.6871 \\
 3 \overline{) 23.3742} \\
 7.7914
 \end{array}$$

$$\begin{array}{r}
 24 \\
 16.961 \\
 \hline
 43.961
 \end{array}
 \quad
 \sqrt{43.96^2 + 6^2} = 44.37 \text{ ch}$$

$$\begin{array}{r}
 3 : 2 : 44.3782 \\
 3 \overline{) 88.7560} \\
 29.5853 \text{ ch}
 \end{array}$$

15) It is required to lay out 5 acres of ground in a triangular form so to be bounded by 1350 of fence the length of one side is to be 500 What must be the lengths of the other sides 502 and 160

$$\begin{array}{r}
 100 : 85 : 85 \\
 3 \overline{) 50} \\
 35 \\
 16 \\
 \hline
 32 \\
 \tan 34.7'
 \end{array}$$

$$\begin{array}{r}
 160 \\
 50 \overline{) 80.0} \\
 16 \\
 \text{Sec } 34.7' = \\
 47.25 = \\
 57.07 = \\
 50 = \\
 85 = \\
 \text{sin } 34.7' = \\
 \text{sin } 72.28
 \end{array}$$

$$\begin{array}{r}
 \text{Ans. } 33.3785 \text{ and } 51.6215 \text{ ch} \\
 34.7' \\
 72.28' \\
 106.35' \\
 180 \\
 \hline
 75.25' \\
 \text{Sin } 75.25' = \\
 34.04' = \\
 57.04' = \\
 \text{Ans } 33.39 +
 \end{array}$$

16) The area of a rectangular field is 42 a. and the length of the diagonal 500 required the sides And 30 & 40 p

$$\begin{array}{r}
 42 \\
 30 \\
 40 \\
 \hline
 1200 = 24 \\
 50
 \end{array}$$

$$\begin{array}{r}
 2 \overline{) 50} \\
 25 \\
 \sqrt{25^2 - 24^2} = 7 \\
 25 - 7 = 18
 \end{array}$$

$$\begin{array}{l}
 \sqrt{18^2 + 24^2} = \sqrt{900} = 30 \\
 \sqrt{50^2 - 30^2} = \sqrt{1600} = 40
 \end{array}$$

178

In a rectangular tract of land containing 588 3/4 the difference of the lengths of the sides is just equal to the difference of the lengths of the longer side and the diagonal hence the sides are required

Square = 4 sides
Triangle = 3 do

$$3 : 588 \frac{3}{4} :: 4$$

$$3 \overline{) 2352}$$

$$784 \overline{) 28 \text{ ans}}$$

$$48 \overline{) 384}$$

$$\begin{array}{r} 40 \overline{) 18} \\ 4 \overline{) 3.2} \\ 58.86 \\ 588.0 \end{array}$$

$$4 : 588 \frac{3}{4} :: 3$$

$$4 \overline{) 1764}$$

$$441 \overline{) 21 \text{ ans}}$$

$$41 \overline{) 41}$$

Ans. 21 & 28 ch.

18 The boundaries of a tract of land are as follows 1st N 12° W 15.20 ch; 2nd N 70° E 20.43 ch 3rd S 6° E 22.49 ch 4th N 86° W 18 ch to the place of beginning within the tract there is a Spring The bearing and distance of which from the 2nd corner is S 75° E 7.90 ch. it is required to cut off 10 A from the west side of this tract by a straight line running through the Spring What must be the distance of the division line from the first corner measured on the south side

Ans 4.6357 ch

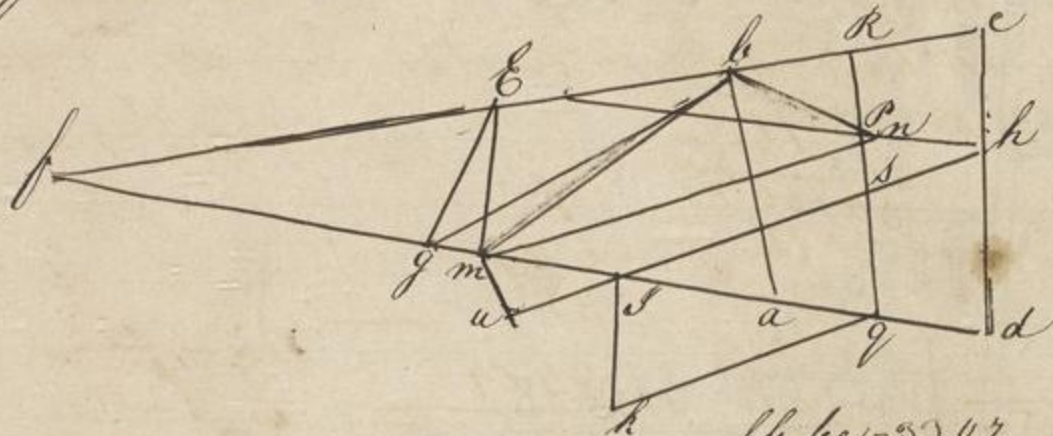
$$\begin{array}{r} S 23^\circ \\ S 145^\circ 30' \\ 7.90 \\ 11.452 \end{array}$$

$$\begin{array}{r} S 23^\circ \\ S 111^\circ 30' \\ 7.90 \\ 4.031 \end{array}$$

$$\begin{array}{r} S 23^\circ \\ S 73^\circ 30' \\ 15.20 \\ 38.72 \end{array}$$

$$\begin{array}{r} 33.07 \text{ ar. ac} \\ 19.36 \\ 37.10 \\ 21.72 \end{array}$$

$$\begin{array}{r} 33.07 \text{ ar. ac} \\ S 23^\circ \\ R 40^\circ \\ \text{Area } 100 \\ - 7.739 \\ 22.46 = \log 1.46923 \\ 6.556 = \log 0.81664 \\ 13.898 = 2 \log 2.28587 \\ 13.898 = 1.14293 \end{array}$$



$$\begin{array}{r} fb - be = 33.07 \\ \frac{1}{2} \text{ of } af = 19.36 \\ eh - ep = 18.008 \\ fm - mi - ep = 18.008 \\ fh = ep = 11.45 \\ hg - ph = 18.008 \\ hg + hi = 28.64 \\ hg - hi = 6.556 \\ 34^\circ 30' - 23^\circ - 11^\circ \end{array}$$

$$\begin{array}{r} ag = fg - fa - fm + mi + iq - fa \\ 21.72 \\ 7.739 \\ 13.898 \\ 43.357 \\ 38.72 \\ ag = 4.637 \text{ Ans} \end{array}$$

$$\begin{array}{r} f - 23^\circ \\ E - 23^\circ \\ b = 84 \frac{1}{2} \\ a = 72 \frac{1}{2} \\ c = 145 \frac{1}{2} \\ p = 11 \frac{1}{2} \\ \text{Area of Square ch} \\ mi = 7.739 \\ ph = 18.008 \\ hi = 11.45 \\ iq = 13.898 \\ ag = 4.637 \end{array}$$

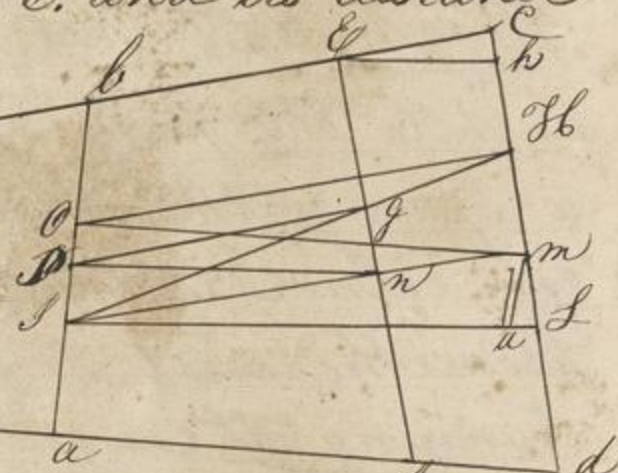

$$\begin{array}{r} 145 \frac{1}{2} \\ 7.739 \\ 163 \frac{1}{2} \\ 11 \frac{1}{2} \end{array}$$

$$\begin{array}{r} 21.72 \\ 7.739 \\ 22.46 \\ 11.45 \\ 18.00 \end{array}$$

Handwritten signature and decorative flourishes at the bottom of the page.

19. The boundaries of a quadrilateral tract of land are as follow: 1st $N 35\frac{1}{2}^{\circ} E$ 23 ch 2nd $N 75\frac{1}{2}^{\circ} E$ 30.50 ch 3rd $S 3\frac{1}{2}^{\circ} E$ 46.49 ch and 4th $N 66\frac{1}{4}^{\circ} W$ 49.64 ch, to the place of beginning. This tract is to be divided into four equal parts by two straight lines one of which is to run parallel to the 3rd side required the distance of the parallel division line from the first corner, measured on the 1st side; also the bearing of the other division line and its distance from the same corner measured on the 1st side.

Ans. Distance of the parallel division line from the 1st corner 32.50 ch the bearing of the other $S 88^{\circ} 22' E$ and its distance from the same corner 6 chains



$P = 58.15$
 $\begin{cases} 78.45 \\ 63 \end{cases} \text{ ar. co.}$
 $\begin{cases} 78.30 \\ 139.45 \end{cases}$
 $ab \begin{cases} 23 \\ 23 \end{cases}$
 to 4th term 383.282
 $cd^2 = \frac{2161.3201}{2/2544.6021}$
 $cf = \sqrt{7272.3010} = 35.67$
 $\begin{cases} 78.15 \\ 78.45 \\ 10.82 \end{cases}$
 17.14
 $\begin{cases} 78.45 \\ 63 \end{cases}$
 17.14
 15.57
 $\begin{cases} 78.30 \\ 63 \end{cases} \text{ ar co}$
 $\begin{cases} 139.45 \\ 78.45 \end{cases}$
 $bc \begin{cases} 30.50 \\ 30.50 \end{cases}$
 to 4th term 675.18
 $ad^2 = \frac{2464.1296}{2/3139.3086}$
 $om = \sqrt{1569.6548} = 39.62$
 $\begin{cases} 38.15 \\ 63 \end{cases} \text{ ar co}$
 10.02
 14.34
 $\begin{cases} 78.30 \\ 63 \end{cases} \text{ ar. co.}$
 $\begin{cases} 139.45 \\ 78.45 \end{cases}$
 $fb \begin{cases} 14.93 \\ 14.93 \end{cases}$
 to 4th term 161.79
 $af^2 = \frac{1056.25}{1/1.218.04} = 24.68$

$\$ 38^{\circ} 15'$
 $\$ 63^{\circ}$
 7.82
 11.19

 $14.94: 24.68:: 5.15 = 5.20$

 $\$ 63^{\circ}$
 $\$ 78^{\circ} 30'$
 8.35
 9.18

 $\$ 63^{\circ}$
 $\$ 88^{\circ} 30'$
 8.05
 5.85

 $45.45: 9.18:: 59.62 = 8$

 62.63
 28.27
 $\tan^{-1} 58.30$
 $\tan^{-1} 26^{\circ} 23'$
 $\text{lik } 22^{\circ} 07'$
 $66^{\circ} 15'$ Bearing of SH
 $\$ 88^{\circ} 22' E$ SH
 $\$ 33.50$
 $\text{and } \$ 88^{\circ} 22' E$
 296

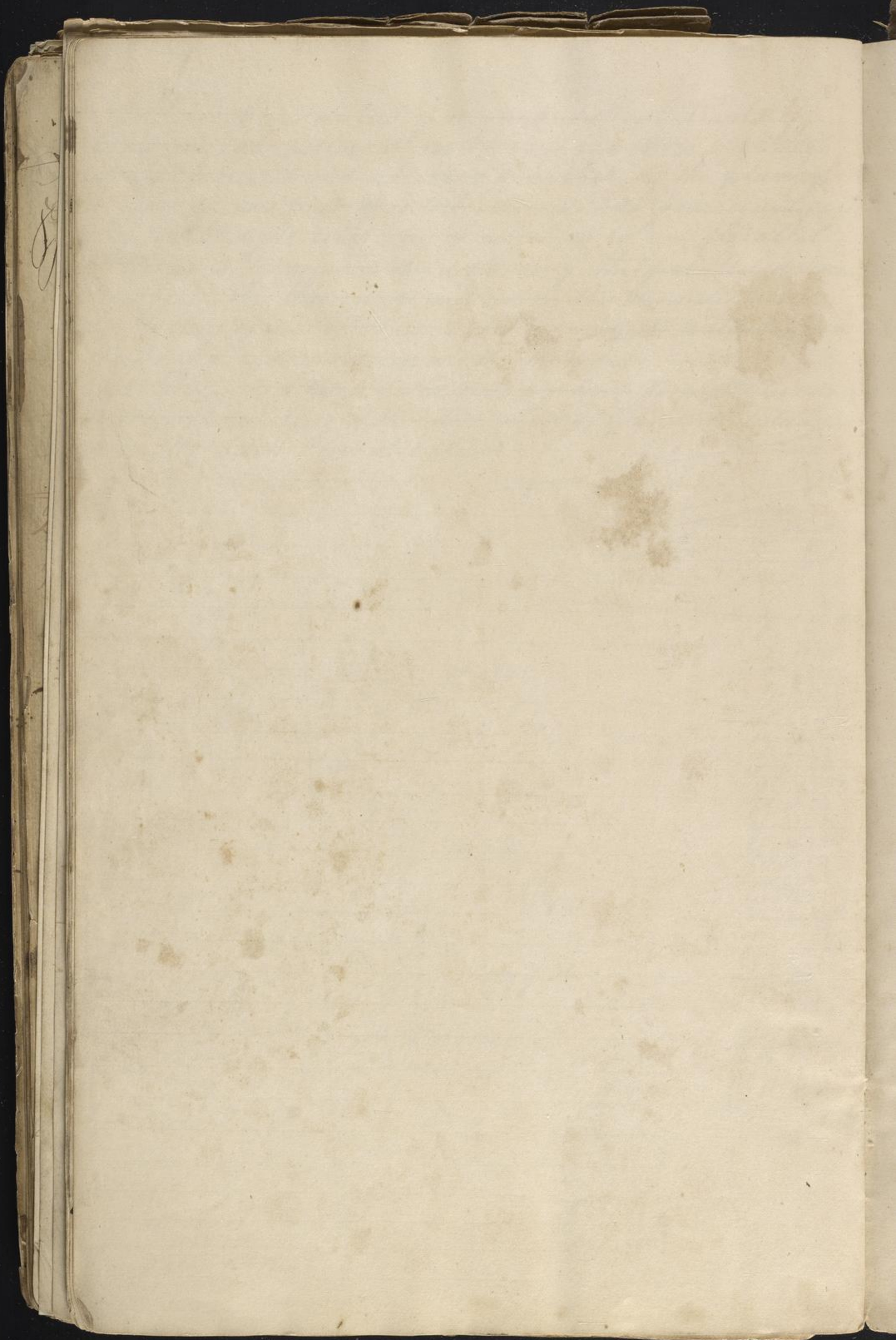
$c = 48.45$
 $d = 62.30$
 $a = 48.30$
 $b = 139.45$

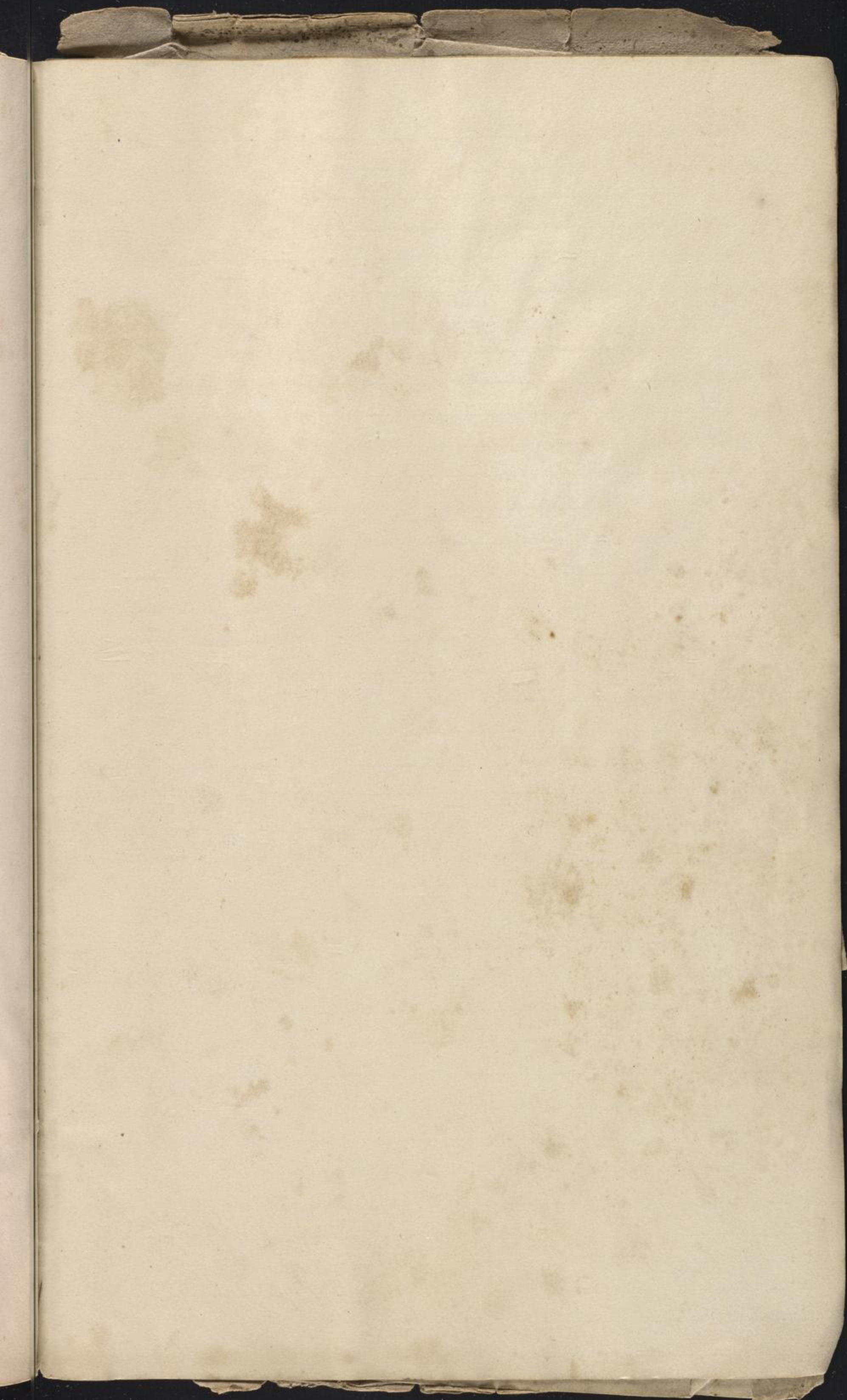
 $af = 23.04$
 $be = 30.50$
 $cd = 46.49$
 $ad = 49.64$

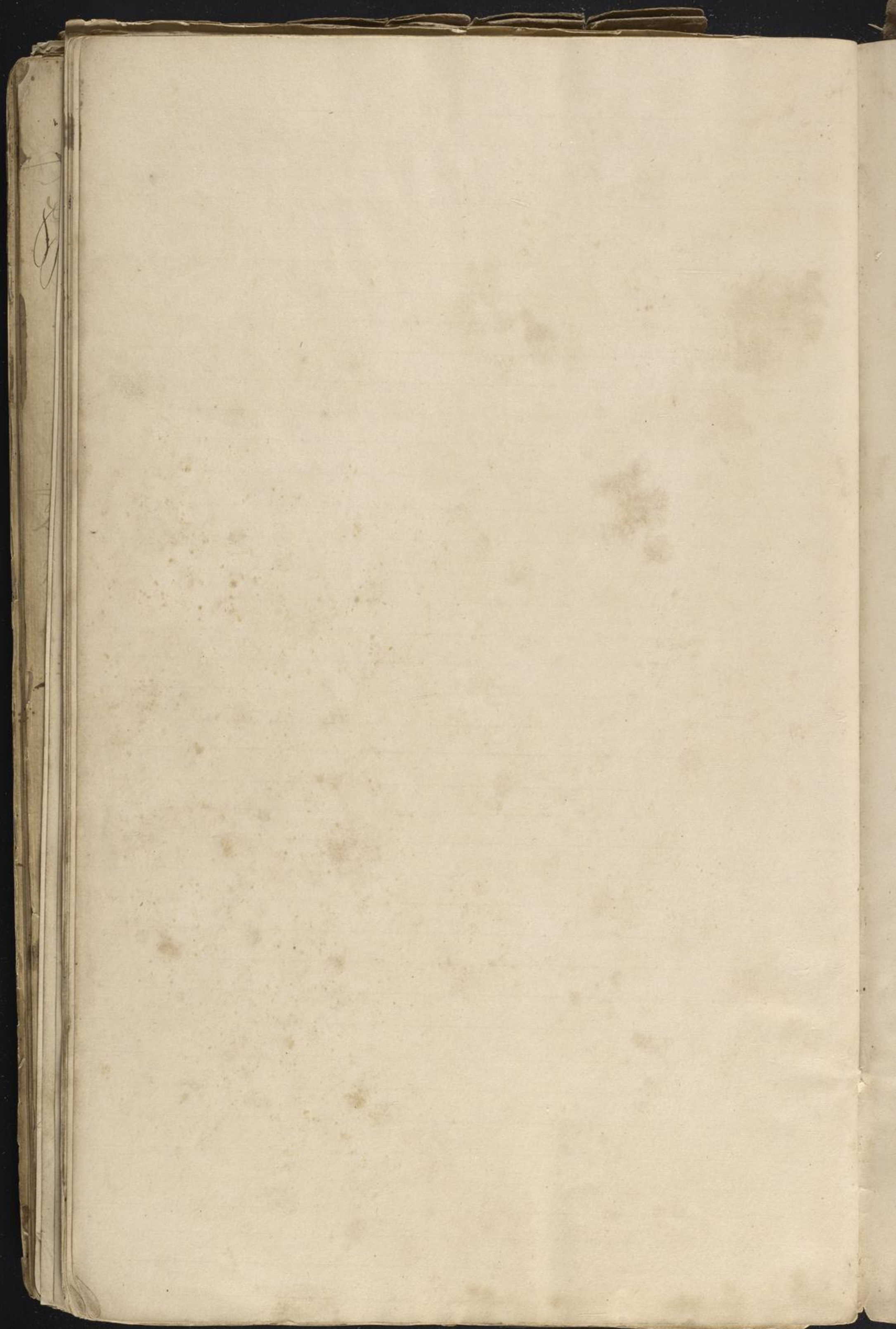
 $ef = 35.67$
 $fd = 14.14$
 $af = 32.00$
 $fe = 15.54$
 $fe = 14.93$
 $om = 39.62$
 $ao = 14.34$
 $on = 24.68$
 $ap = 11.19$
 $op = 5.20$
 $po = 8.35$
 $op = 3.15$
 $ml = 9.18$
 $ul = 5.83$
 $rl = 45.45$
 $mk = 8$
 $lk = 14.18$
 $al = 6$

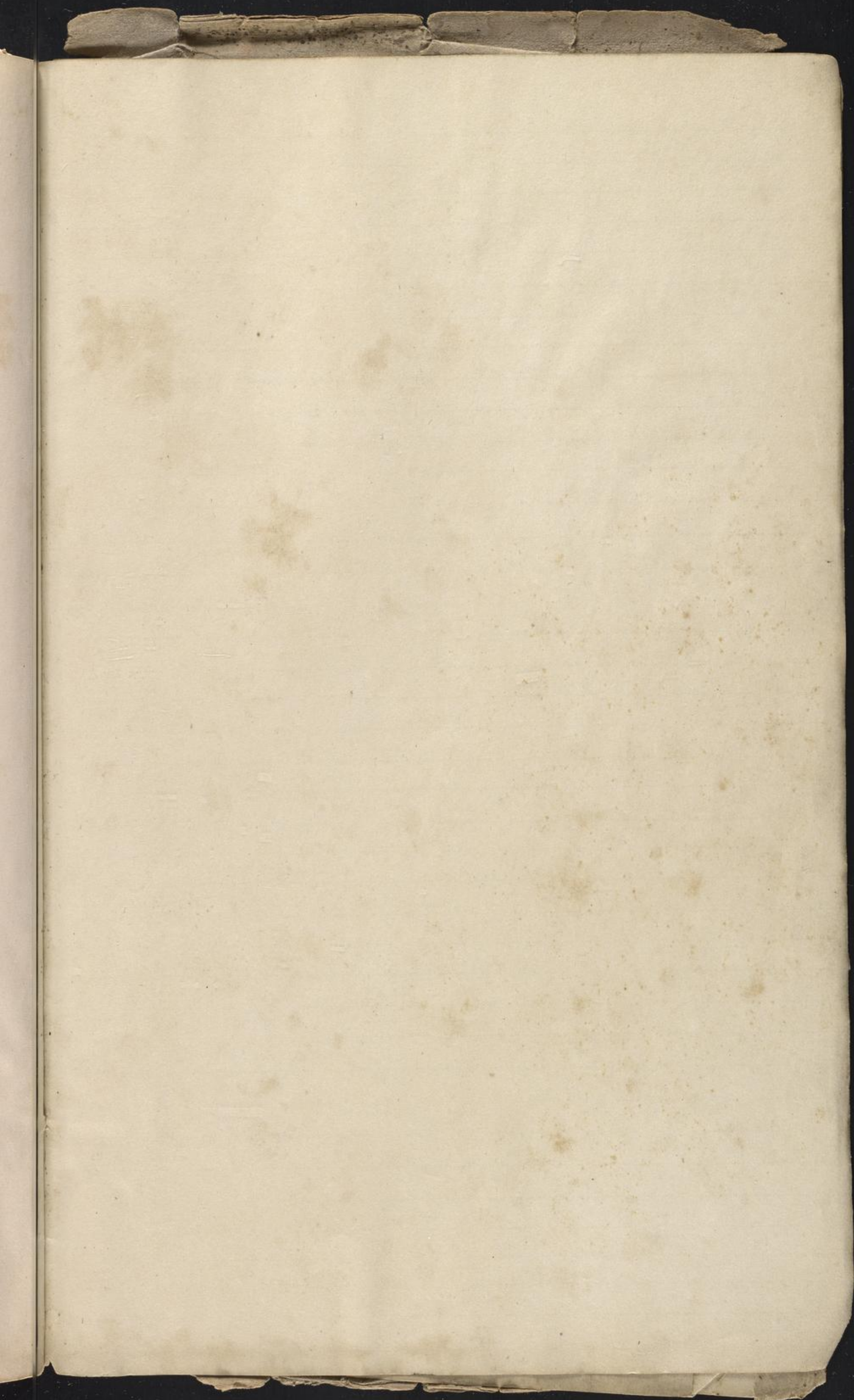
$cd - ef = 10.82$
 $ad - fd = 32.50$
 $bc - ct = 14.93$
 $ad - om = 10.02$
 $af - pn = 8.82$
 $ao - ap = 3.15$
 $om - pn = 14.94$
 $ap - fp = 5.99$
 $fp + po = 8.35$
 $ul + om = 45.45$
 $mh + ly = 17.18$
 $li + lh = 62.63$
 $li - lh = 28.27$
 $ao - fo = 6$

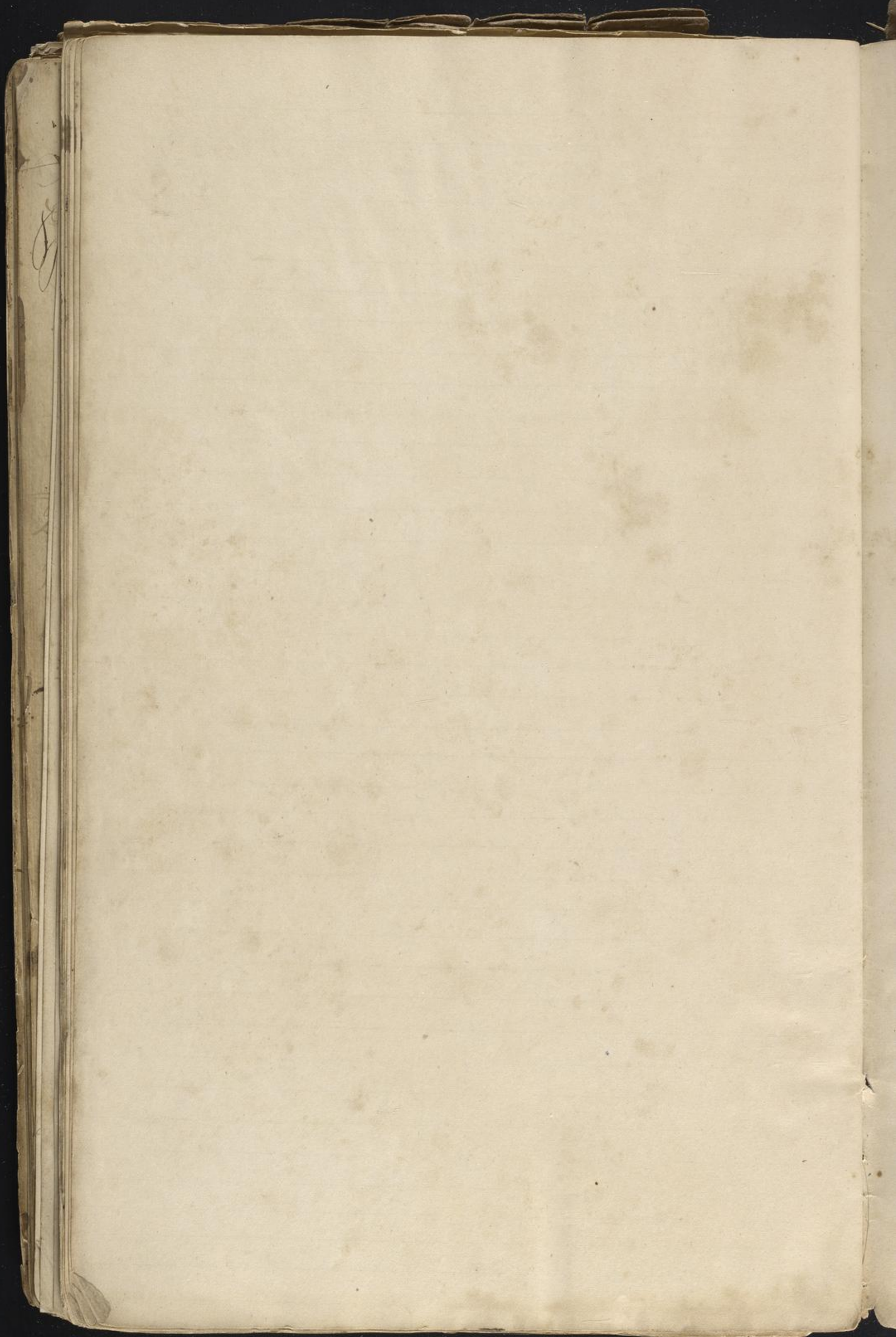
h
f
ark
slon
com
enck
ce
t
fb
m
L
d
45
36
45
h
9
4
7
4
0
7
3
2
4
68
9
0
5
5
3
5
18

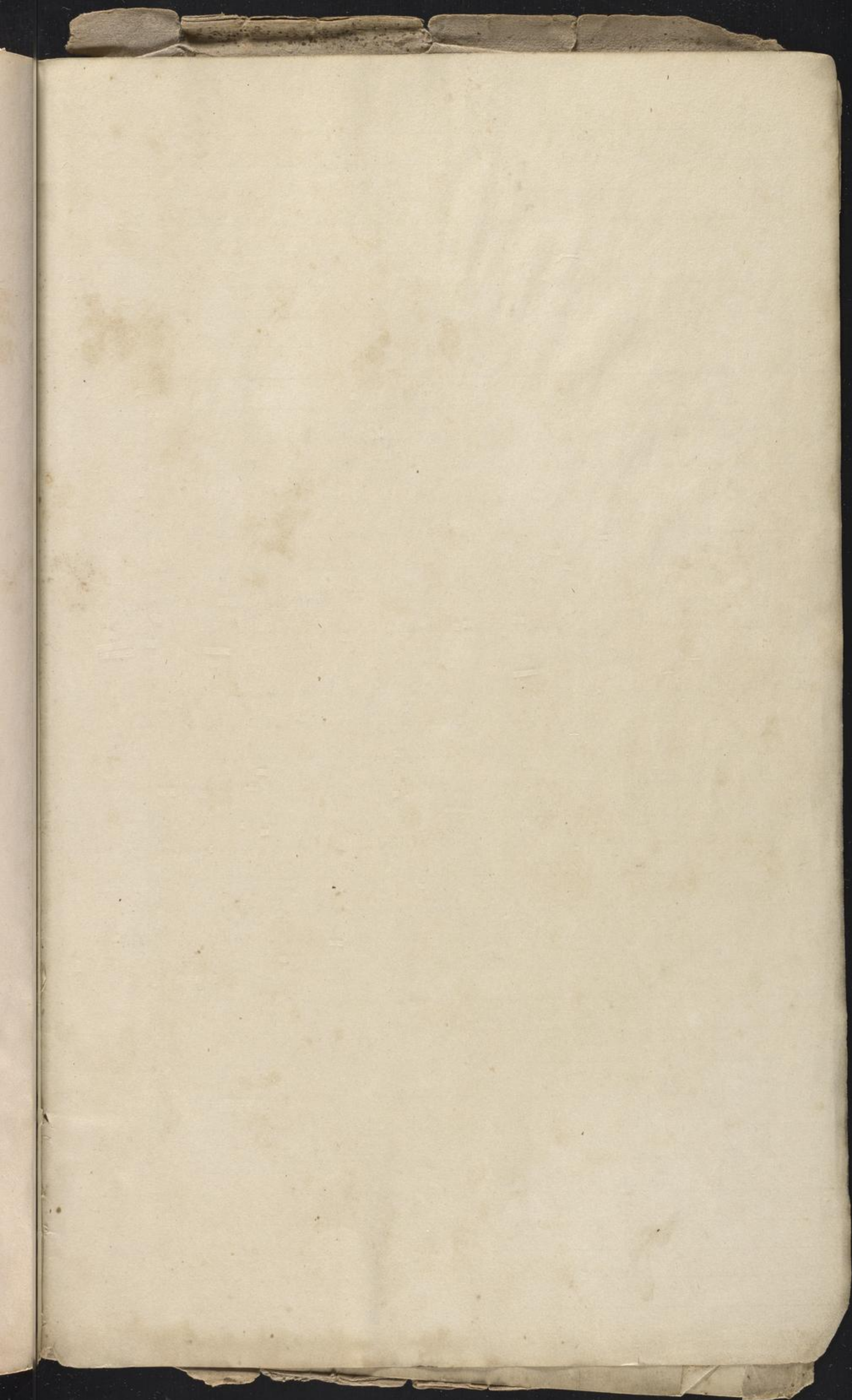


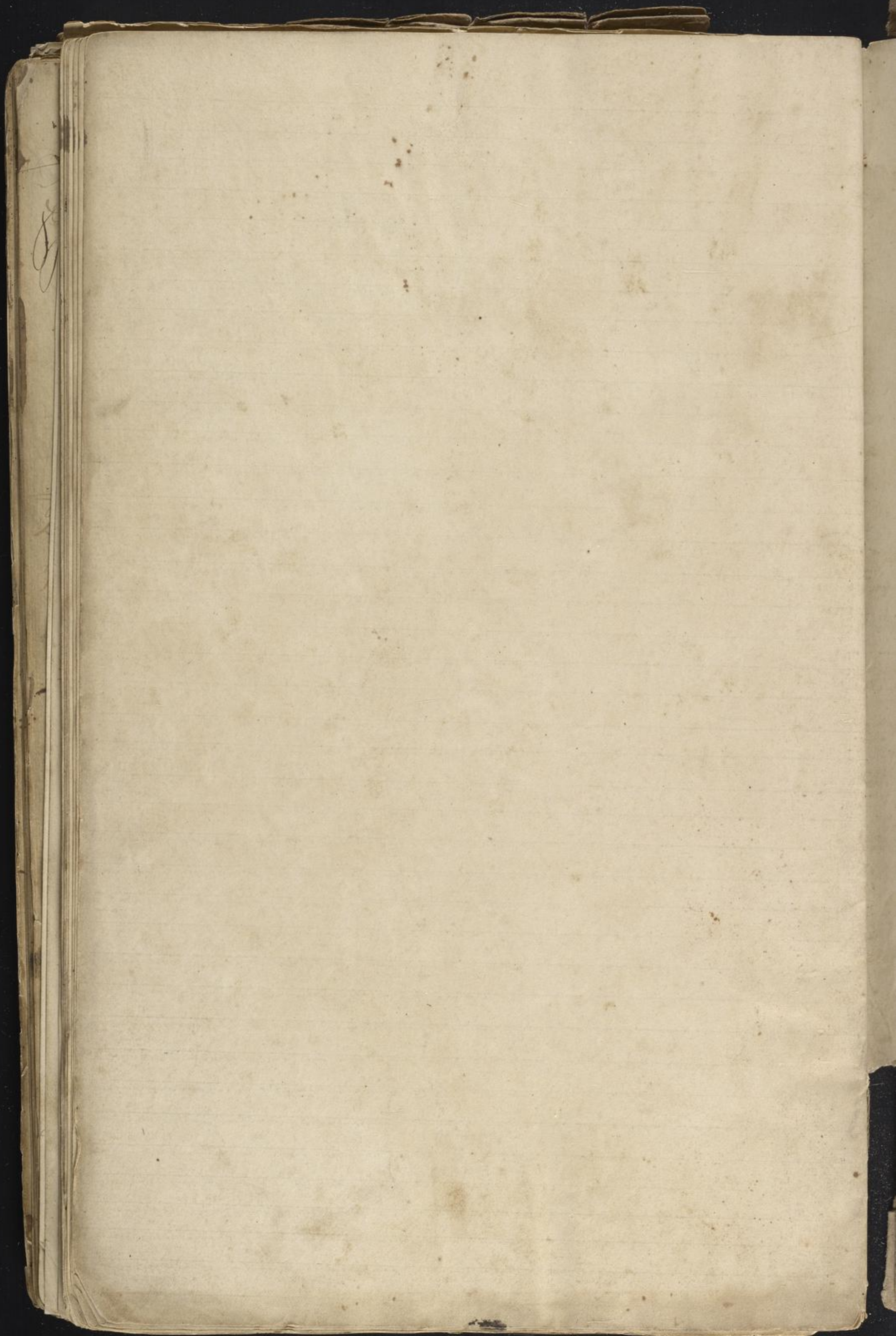


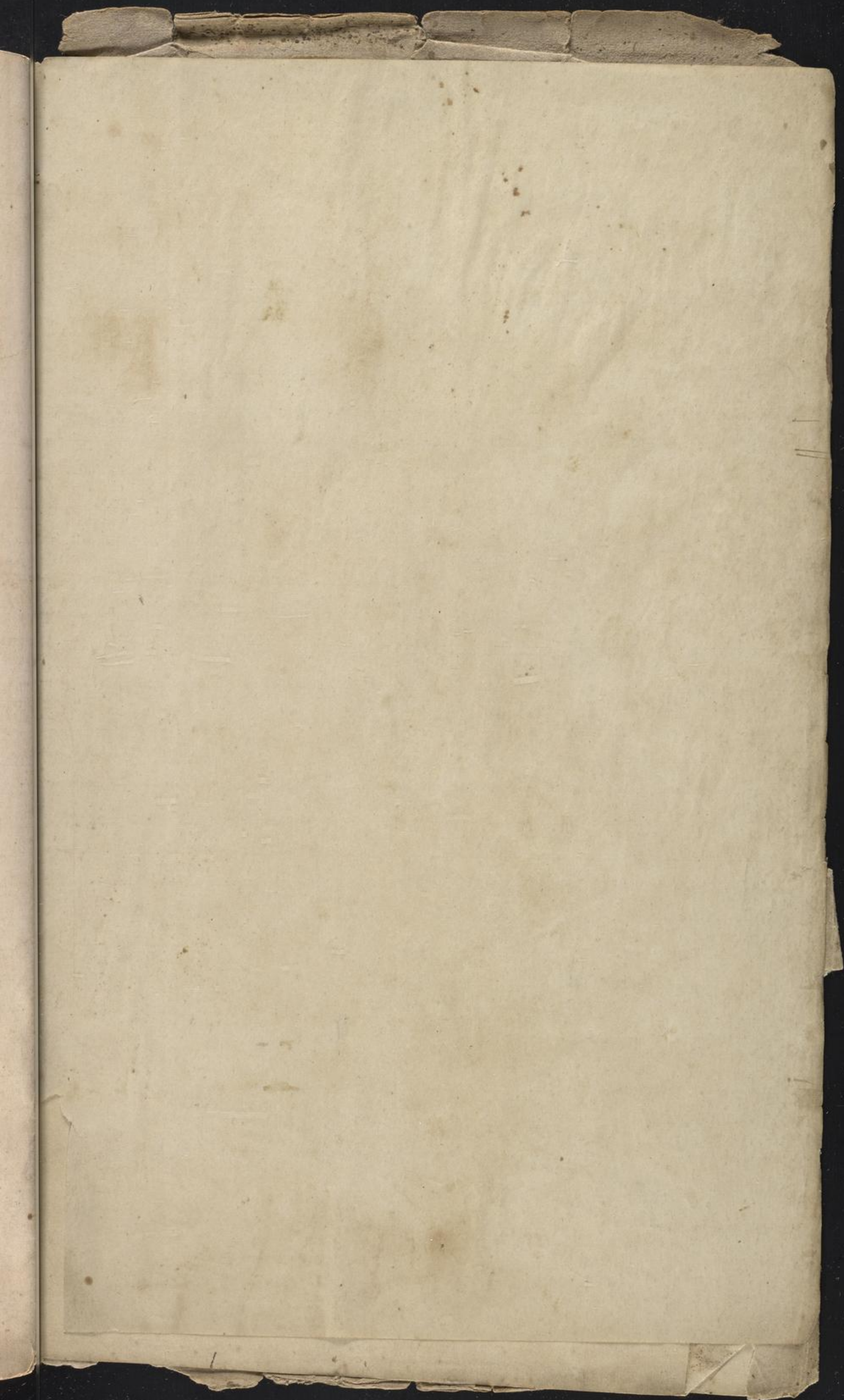


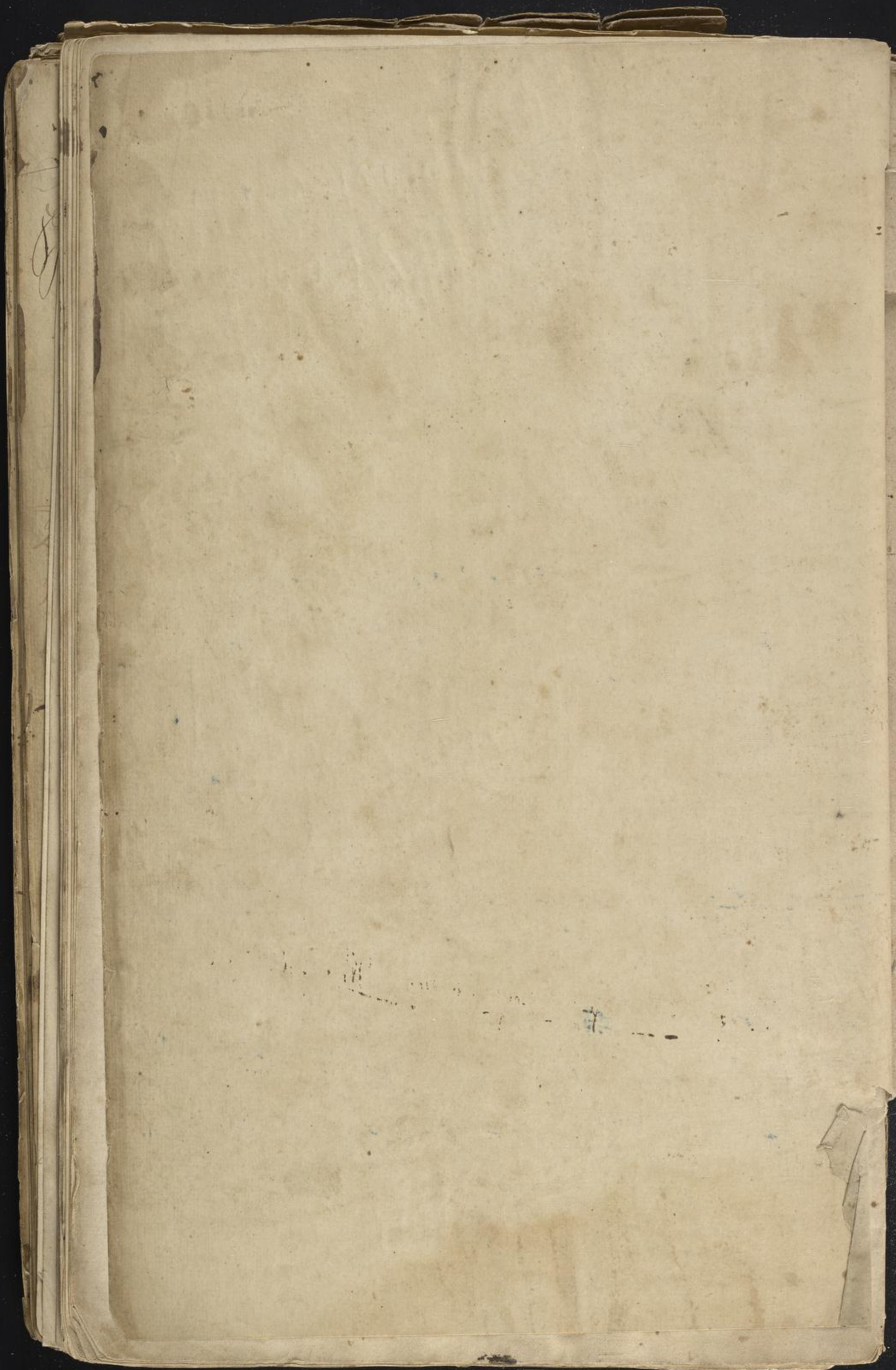


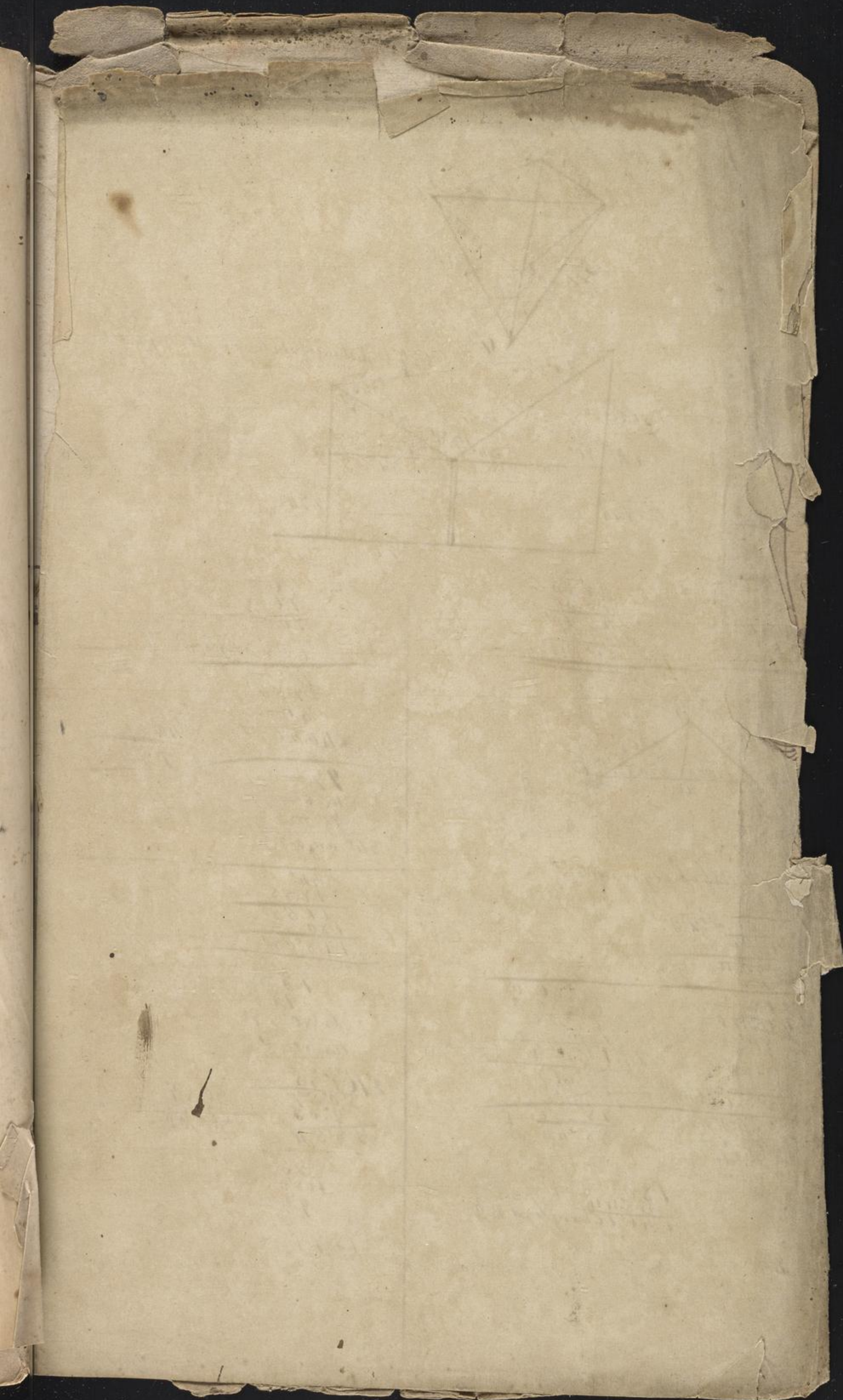


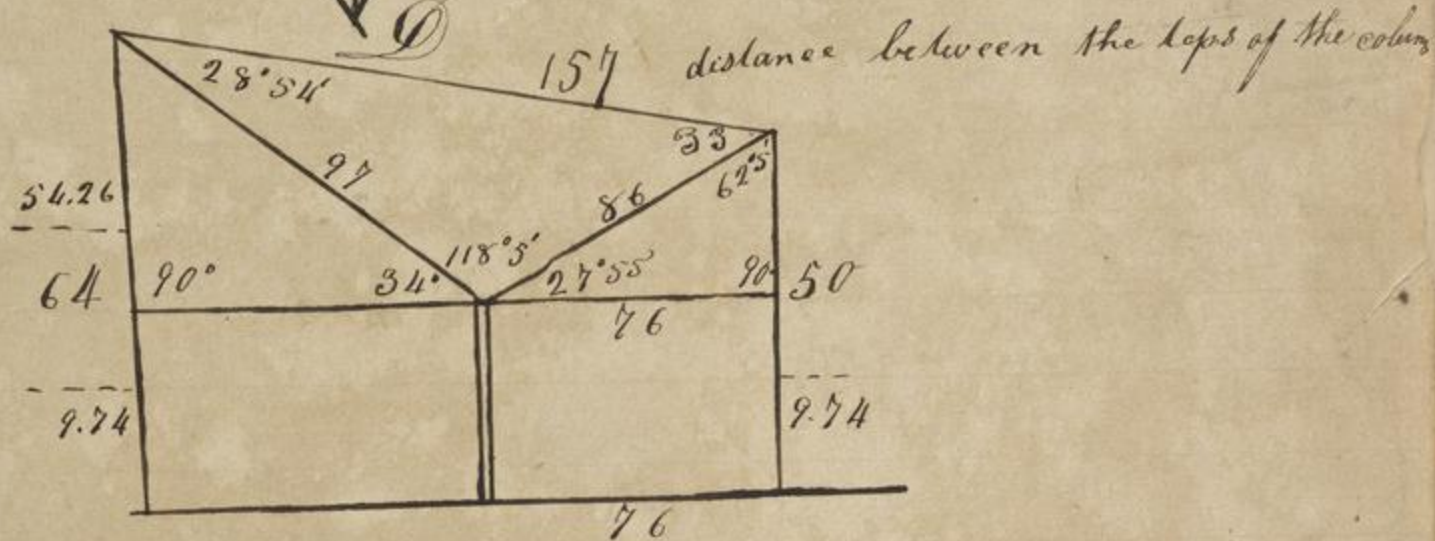
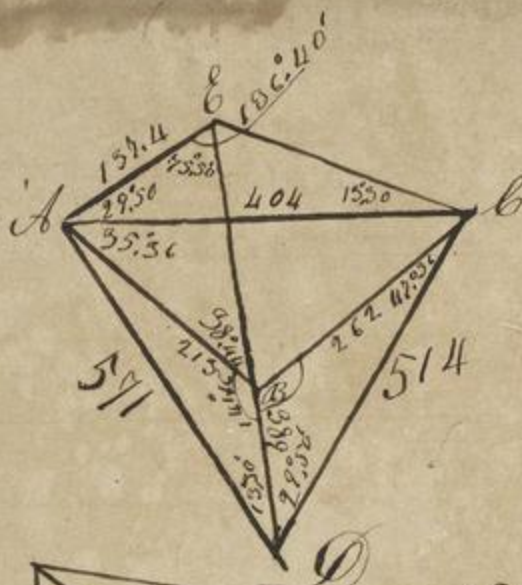












$$\begin{array}{r}
 S \ 136.40' = \\
 13.30' = \\
 1104 \\
 AB \\
 \hline
 29.50' \\
 13.30' \\
 45.20' \\
 180 \\
 156.40' = E
 \end{array}$$



$$\begin{array}{r}
 04 = \\
 75 = \\
 49 =
 \end{array}$$

$$\begin{array}{r}
 257.61 \text{ diff of segments} \\
 28.80 \\
 202 \\
 230.80 \text{ segment} \\
 173.20
 \end{array}$$

$$\begin{array}{r}
 350.4 \\
 75 \\
 \hline
 213 = \\
 173.20 = \\
 90 = \\
 54.24' \\
 90 \\
 35.36 \text{ Angle } a \\
 350.4 = \\
 75.6 = \\
 \tan 54.14' = \\
 18.38'
 \end{array}$$

$$\begin{array}{r}
 180.00 \\
 38.44' \\
 141.66 \text{ angle } ABD
 \end{array}$$

$$\begin{array}{r}
 86 = \\
 76 = \\
 90 = \\
 62.5' \text{ angle}
 \end{array}$$

$$\begin{array}{r}
 90 = \\
 27.55' \\
 86 = \\
 40.26 \\
 50 \\
 40.26 \\
 9.74
 \end{array}$$

$$\begin{array}{r}
 97 = \\
 54.26 = \\
 90 = \\
 34.0 \text{ angle}
 \end{array}$$

$$\begin{array}{r}
 34.0 \\
 27.55 \\
 61.55 \\
 180 \\
 118.05'
 \end{array}$$

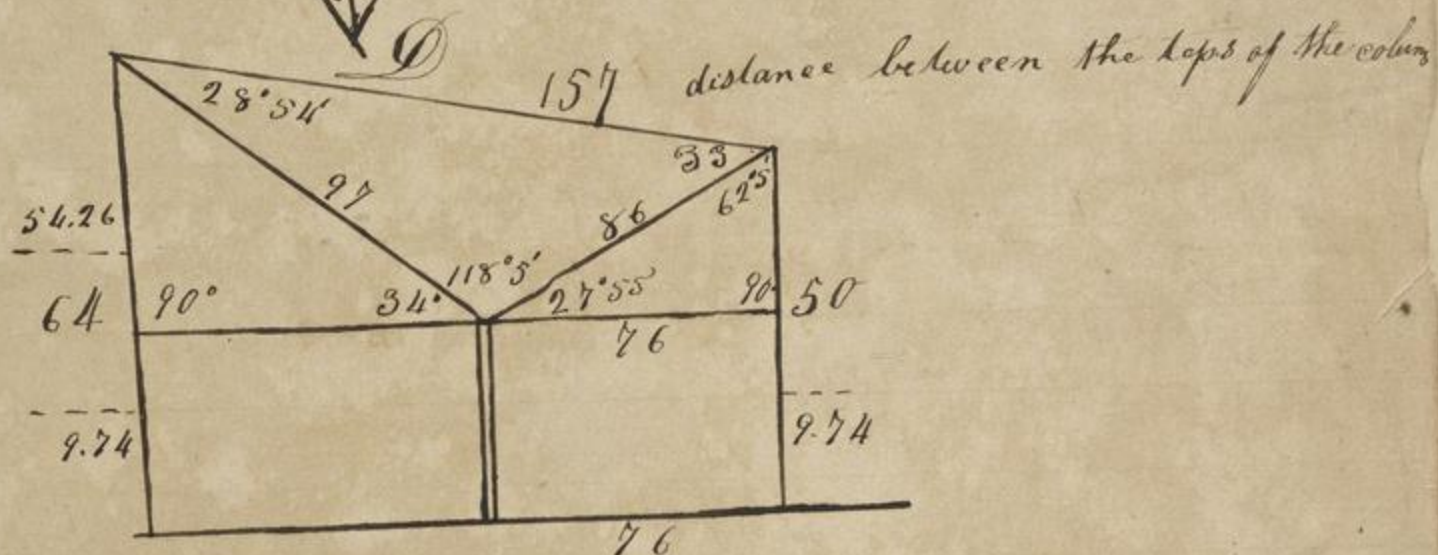
$$\begin{array}{r}
 183 = \\
 11 = \\
 \tan 30.54' \\
 \tan 9.3' \\
 2161.55 \\
 30.54' \\
 2.03 \\
 28.54'
 \end{array}$$

$$\begin{array}{r}
 83 = \\
 118.05 = \\
 97 =
 \end{array}$$

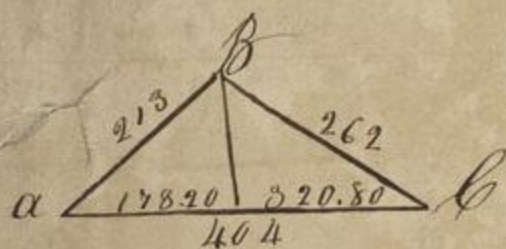
$$157.1$$

the colony

... his neighbour
A man may deceive his neighbour Wm Hampton
A man may deceive his neighbour Wm H.
A man may deceive his neighbour Wm H. McCormick
A man may deceive his neighbour Wm H. McCormick



$$\begin{array}{r} 29^{\circ} 50' \\ 13.30 \\ \hline 43^{\circ} 20' \\ 180 \\ \hline 156^{\circ} 40' = \ell \end{array}$$



$$\begin{array}{r} 04 = \\ 75 = \\ 40 = \end{array}$$

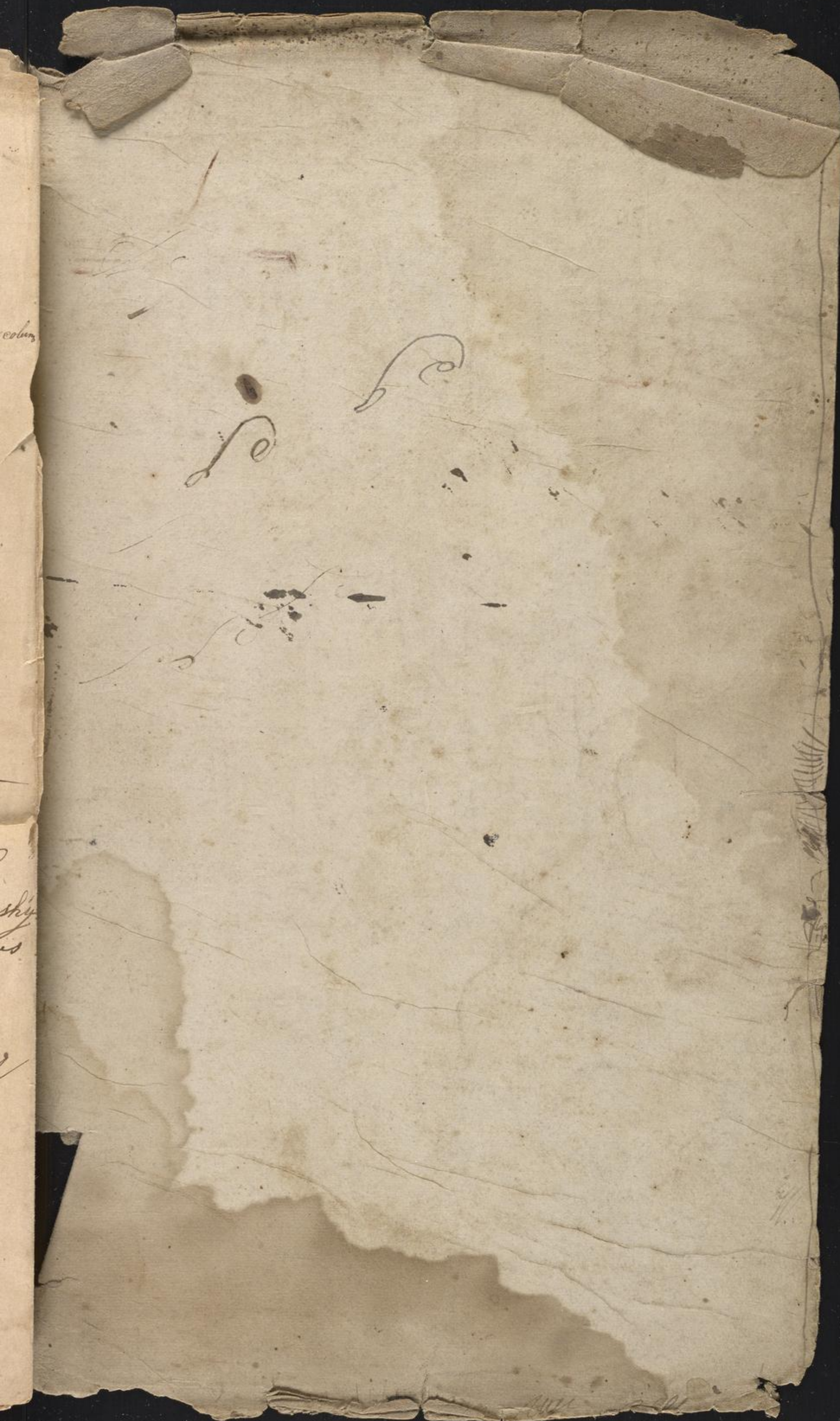
$86 =$
 $76 =$
 $90^\circ =$
 $62^\circ 5'$ angle

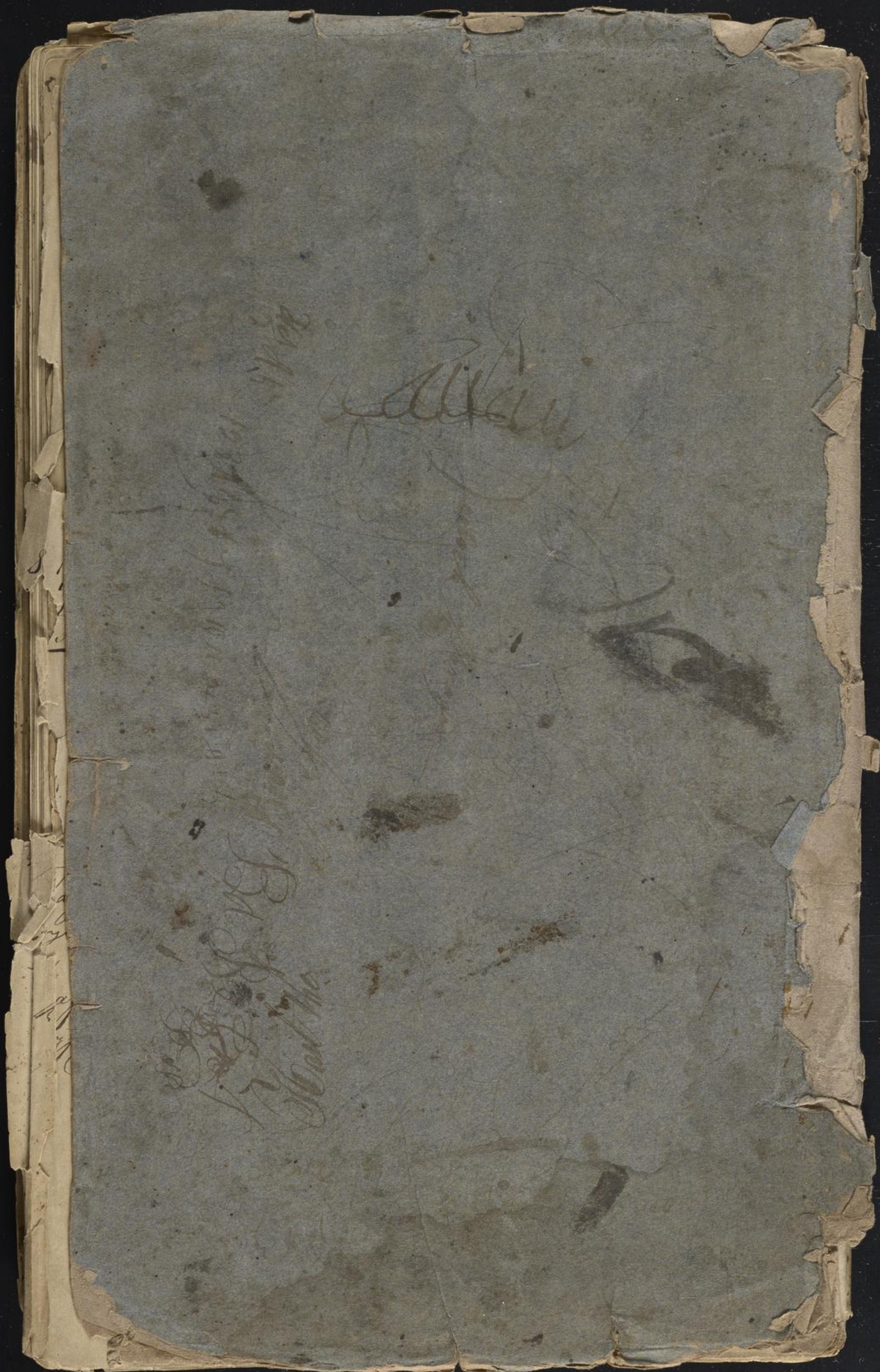
$$\begin{array}{r} 90' = \\ 27^{\circ} 55' = \\ 86 = \\ 40.26 \end{array} \quad \begin{array}{r} 50 \\ 40.26 \\ \hline 9.71 \end{array}$$

$27 =$
 $54.26 =$
 $90^\circ =$

Tayett County Pennsylvania Georges Township
Tayett county Pennsylvania Geones Township James
ayette County Pennsylvania Georges town
ayette County Pennsylvania Georges township
B C D E F G H I J K L M N

[Faint handwritten notes and scribbles, possibly including "H. B." and "A. W."]





30. What will a tax upon 763*l*
15*s* be at the rate of 3*s* 6*d* per
pound. Ans 133*l* 13*s* 10*d* $\frac{1}{2}$

37 If 5 yards of cloth cost 148^{2d} what must be given for 9 peeces containing each 21 yds. 19^{2d} Ans 27¹¹ 15 100²

$$\begin{array}{r} 21 \times 9 \\ 859 \\ 765 \\ 170 \\ 53550 \\ 765 \\ 20130050 \\ 12)6502 \cdot 10 = 2 \\ 20)511 \cdot 10 \\ 27 \cdot 1 \cdot 10 \frac{1}{2} \text{ Ans} \end{array}$$

38 If a persons estate be worth 3858 dollars 24 cents a year out of which he saves 1200 dollars how much per day will the remainder be. Ans 728^{2d}

$$\begin{array}{r} \text{days } 3858 \text{ day} \\ 1200 \\ 365 : 265824 :: 1 \\ 265824 \quad 728 \frac{1}{2} \\ 2555 \\ 1032 \\ 220 \\ 220 \\ 2011 \end{array}$$

39 If a man's annual income be 1333 dollars and he expends daily 2 dollars 14 cents how much will he save at the years end Ans 551.90

$$\begin{array}{r} \text{day } 2 \text{ day} \\ 1 : 214 :: 365 \\ 1560 \\ 365 \\ 1333 \\ 78110 \\ 551900 \text{ Ans } 730 \\ 78110 \end{array}$$

40 If a staff 4 feet long cast a shade (on level ground) 7 feet what is the height of that steeple whose shade at the same time measures 198 feet 113 ft. 7

$$\begin{array}{r} \text{ft ft ft} \\ 7 : 4 :: 198 \\ 7772 \\ 11377 \text{ Ans} \end{array}$$

41 The earth being 360 degrees in circumference turns round on its axis in 24 hours. how far are the inhabitants at the equator carried in one minute a degree there being 69¹/₂ miles. Ans 1706

$$\begin{array}{r} 360 \text{ deg } 16 \\ 24 : 360 :: 1 \\ 1440 \quad 360 \frac{1}{2} \\ 3240 \\ 2160 \\ 1440 \quad 17 \cdot 3 \text{ Ans} \\ 15020 \\ 10620 \\ 10080 \\ 540 \\ 4320 \quad 3 \text{ fur} \\ 4320 \end{array}$$

42 A merchant would lay out in spices 1498 dollars viz. cloves at 53 cents per pound mace at 74 cents cinnamon at 40 cents and nutmegs at 27 cents and he would have an equal quantity of each sort what must quantity be. Ans 700 lb of each sort.

$$\begin{array}{r} 53 \\ 74 \\ 40 \\ 27 \\ 214 : 1 :: 149800 \\ 149800 \quad 700 \\ 149800 \text{ Ans} \end{array}$$

43 A goldsmith bought of a merchant 14 lb 3 oz 8 dwt of gold for 1371 dollars 20 cents how much per ounce Ans 8 dollars 07

$$\begin{array}{r} 14 \cdot 3 \cdot 8 : 137120 :: 1 \\ 12 \\ 1720 \\ 137120 \\ 3428 \quad 274240 \quad (800 \text{ Ans} \\ 274240 \end{array}$$

44 How many reams of paper at 1 dollar 66 cents. 1 dollar 94 cents and 2 dollars 31 cents per ream and of each an equal number may be purchased with 528 dollars 66 cents Ans 89 reams of each sort

1
 20
 20
 DC
 1.66
 1.97
 2.31 ream
 5.94 : 12 : 528.66
) 52866 (89
 4752
 5346
 5346

47 Bought 476 A. 30r.
 28 P. of land at 9 dollars per
 acre the value thereof is re
 quired: Ans 4292.825 m Ans
 A P A R B
 1 : 9 : 476.3.28
 4

145 If 9c 3qr. of sugar cost 27l
 31 175 6d what will 2c 1qr 11lb
 cost Ans 6l 14s 3d
 1d 3p
 C q^r S C q^r lb
 9 : 3 : 27 : 175.6 : : 2 : 1 : 11
 4 20
 39 557
 28 12
 312 6690
 78 263
 1092 20070
 40140 (12)
 13380 1611
 1092 1759470 (20) 13443
 1092 66711
 6552 6.14.3 ans
 1227 £ 5 D
 1052
 1350
 1092
 2258

190740
 763089 D C m
 160 686772 (429232.5
 640
 467
 320
 1477
 1440
 372
 320
 520
 1120
 320
 800
 800

32 at 46 Sold 59c 1qr 11lb of sugar
 at 28s 7d per hundred weight
 what was the amount Ans 8l 11s
 lb S P C q^r lb
 112 : 28.7 : : 59 : 1 : 11
 12 4
 343 227
 28
 1910
 474
 6650
 343
 19950 (12)
 26600
 17950
 112 2280950 (20) 2365
 224 2016921
 409 84.17.1
 386 S P
 735
 672
 630
 560
 10
 280 (12)

33 with
 no. a
 63 a
 Ans

Single Rule of Three ^{Inverse}

2 What quantity of shalloon that is 3 qrs of a yard wide will line $\frac{1}{2}$ yards of cloth that is $\frac{1}{4}$ yard wide? Ans 15 yards.

$$\begin{array}{rcl} \text{qr} & \text{yds} & \\ 3 & : \frac{3}{4} & :: \frac{1}{4} \\ \hline & 3 & \end{array}$$

990
15 Ans

3 If 100 men can finish a piece of work in 12 days how many are sufficient to do it in three days. Ans 400 men.

$$\begin{array}{rcl} \text{days} & \text{men} & \\ 12 & : 100 & :: 3 \end{array}$$

31200
400 Ans

4 How much in length that is $\frac{1}{4}$ inches broad will make a square foot Ans 32 inches

$$\begin{array}{rcl} \text{in} & \text{in} & \\ 144 & : 1 & :: \frac{1}{4} \end{array}$$

9288
32 Ans

5 How many yards of matting 2 feet 6 inches broad will cover a floor that is 27 feet long and 20 broad Ans 42 yards.

$$\begin{array}{rcl} \text{ft} & \text{ft} & \text{ft in} \\ 20 & : 27 & :: 2 \frac{1}{2} \end{array}$$

240
27
1680
480
326480
3216
72 yards

6 How many yards of cloth 3 qrs wide are equal in measure to 30 yards of 5 qrs wide Ans 50 yards

$$\begin{array}{rcl} \text{qr} & \text{yds} & \\ 5 & : 30 & :: 3 \end{array}$$

3150
50 Ans

7 If 100 l principal in 12 months gain 6 l. interest what principal will gain the same in 8 months Ans 150 l

$$\begin{array}{rcl} \text{lb} & \text{lb} & \\ 12 & : 100 & :: 8 \end{array}$$

81200
150 Ans

8 How many yards of paper $\frac{1}{4}$ yards wide will be sufficient to hang a room which is 20 yards in circumference and 11 in height

Ans 64 yards.

$$\begin{array}{rcl} \text{yds} & \text{yds} & \\ 4 & : 20 & :: \frac{1}{4} \end{array}$$

16120
20
51320
64 Ans

9 How many men must be employed to finish a piece of work in 15 days which 5 men can do in 24 days? Ans 8 men

$$\begin{array}{rcl} \text{days} & \text{men} & \\ 24 & : 5 & :: 15 \end{array}$$

15120
120 8 Men

10 In how many days will 8 men finish a piece of work which 5 men can do in 24 days Ans 15 days

20
20

men days men
5 : 24 :: 8
8120 Days

31
Hob
1d3/4

11 If a footman perform a journey in 3 days when the days are 16 hours long how many days will he require of 12 hours long to perform the same in Ans 11 days

16 : 3 :: 12
12118 Days Ans

12 If 6 men can reap a field of wheat in 12 days in what time will 24 men do it Ans 3 days

6 : 12 :: 24
24123 days

32
at

13 How much in length that is 8 poles in breadth must be taken to contain an acre Ans 20 perches

160 : 1 :: 8
8160 P Ans

33
wid
mo.
65
A

14 A lent B 500l for 6 months: how long ought B to lend A 220l to be equivalent Ans 13 mo 19 da

500 : 6 :: 220
220) 3000 (13 mo 19 da
860
1400
1400
2200
1980

15 If when the price of a bushel of wheat is 11s 8d. the penny loaf weighs 12oz what must the penny loaf weigh when a bushel is worth but 3s 8d no 18oz

3 P 04 S
4 6 : 12 :: 3
12
542
36

36) 648 (1802 Ans
288
288

16 What is the weight of a pea to a steel yard which being suspended 39 inches from the center of motion will equilibrate 208 lb. suspended at the draught end 3 quarters of an inch. Ans 11 lb

3 : 208 :: 39
1561624 11 lb Ans

17 Suppose 800 persons in garrison with provision sufficient for two months: how many must depart that the provision may serve them 5 months

16 persons 16 ans 480
2 : 800 :: 5
51600
320 800
320
480 Ans

18 How many yards of matting that is half a yard wide will cover a room that is 18 ft wide and 3 long. Ans 120 yds

18 : 30 :: 1/2
12
21630 3
18) 6480 (360 Ans
54
1080

19 How wide must a lot of ground be to contain an acre when it is 13 1/2 poles in length Ans 11 B. 4 yds 2 ft 0 in 2 b.c

P P P
 $160 : 1 :: 13\frac{1}{2}$
 $27 \overline{) 320} \quad 11 \text{ P } 27$
 $\underline{27}$
 50
 $\underline{27}$
 $23\frac{1}{2}$
 $11\frac{1}{2}$
 $\underline{11\frac{1}{2}}$
 $126\frac{1}{2}$
 $27 \overline{) 253} \text{ (11 P 27)}$
 $\underline{27}$
 50
 $\underline{27}$
 $23\frac{1}{2}$
 $11\frac{1}{2}$
 $\underline{11\frac{1}{2}}$
 $126\frac{1}{2}$
 $27 \overline{) 253} \text{ (11 P 27)}$
 $\underline{27}$
 50
 $\underline{27}$
 $23\frac{1}{2}$
 $11\frac{1}{2}$
 $\underline{11\frac{1}{2}}$
 $126\frac{1}{2}$

$27 \overline{) 253} \text{ (11 P 27)}$
 $\underline{27}$
 50
 $\underline{27}$
 $23\frac{1}{2}$
 $11\frac{1}{2}$
 $\underline{11\frac{1}{2}}$
 $126\frac{1}{2}$

$54 \overline{) 108} \text{ (2 ft)}$
 $\underline{108}$
 0

$54 \overline{) 108} \text{ (2 b.c)}$
 $\underline{108}$
 0

20 If when the price of a bushel of wheat is 6s 3d the penny loaf weighs 9oz. what ought it to weigh when wheat is at 8s 2d per bushel Ans

$60\% \cdot 13 \text{ dwt } 9 \text{ oz } 3 \text{ P}$
 $6 \cdot 3 : 9 :: 8 \cdot 2\frac{1}{2}$
 $\underline{12}$
 75
 $\underline{300}$
 $394 \overline{) 2700} \text{ (60\% 13 dwt Ans)}$
 $\underline{2364}$
 336
 $\underline{336}$
 0

$14 \overline{) 276} \text{ (13 dwt)}$
 $\underline{14}$
 136
 $\underline{128}$
 8
 $\underline{8}$
 0

21 In what time will 600l gain 50l interest when 80l would gain it in 15 years? Ans. 2 years.

$600 \overline{) 1200} \text{ (2 years Ans)}$
 $\underline{1200}$
 0

Application 1283

1 If 3 quarters of a yard of velvet cost 7s 3d how many yards can I buy for 13l 15s 6d Ans

$28 \text{ yds. } 2 \text{ qrs. } 3 \text{ P}$
 $73 \cdot 156 : 3 :: 4 \cdot 3$
 $\underline{20}$
 275
 $\underline{12}$
 33063
 $87 \overline{) 9918} \text{ (111 28.2 Ans)}$
 $\underline{87}$
 121
 $\underline{87}$
 348
 $\underline{348}$
 0

2 If an ingot of gold weighing 9lb. 9oz 12dwt be worth 111l 12s. what is that per grain Ans

$10\frac{3}{4} \text{ lb. } 0 \cdot 2 \text{ dwt } 12 \text{ oz } 9 \text{ P}$
 $9 \cdot 9 \cdot 12 : 111 \cdot 12 :: 1$
 $\underline{12}$
 117
 $\underline{20}$
 2352
 9488
 $\underline{11704}$
 56448
 $\underline{141}$
 56448
 $\underline{56448}$
 0

3 A borrower of 250l. for 7 months and in return lends him 300l. how long ought B to keep it that the interest of it may be equal to that of the first sum Ans 5 mo. 45 da.

$250 : 7 :: 300$
 $300 \overline{) 1750} \text{ (5 mo. 45 da. Ans)}$
 $\underline{1500}$
 250
 $\underline{250}$
 0

4 If a persons income be 500 guineas a year and he spends 1987d sterling per day how much will he have saved at the years end
 Ans 167l 12s 1d. sterling.

$$\begin{array}{r} \text{d} \quad \text{s} \quad \text{p} \quad \text{days} \\ 1 : 19 : 7 :: 365 \\ \hline 12 \quad 235 \\ 235 \quad 1825 \\ \hline 1095 \\ 730 \\ \hline 12 \quad 857 \quad 75 \\ 20 \quad 71 \quad 117 \quad 11 \\ \hline 357 \quad 7 \quad 11 \\ \hline \text{Ans} \end{array}$$

5 At 13s 2d per yard what is the value of a piece of cloth containing 52 English ells and 3 yds of 13l 8s 5d 1/4.

$$\begin{array}{r} \text{yds} \quad \text{s} \quad \text{d} \quad \text{Ells} \quad \text{qr} \\ 1 : 13 : 2 \frac{1}{2} :: 52 : 3 \\ \hline 4 \quad 12 \quad 5 \\ 4 \quad 158 \quad 263 \\ \hline 634 \quad 634 \\ \hline 1052 \\ 789 \\ \hline 1578 \\ 11 \quad 1667 \quad 12 \\ \hline 11 \quad 1685 \quad 2 \\ 12 \quad 104 \quad 21 \quad 4 \\ \hline 20 \quad 868 \quad 5 \\ \hline 113 \quad 8 \quad 5 \frac{1}{4} \text{ Ans} \end{array}$$

6 If 30 men can perform a piece of work in 11 days: how many men will accomplish another piece of work four times as large in 12 days?

$$\begin{array}{r} \text{days} \quad \text{men} \quad \text{days} \\ 11 : 30 :: 12 \\ \hline 120 \\ 11 \quad 120 \\ \hline 110 \text{ men Ans} \end{array}$$

7 The rents of a whole parish amount to 1750l on which is assessed 32l 16s 3d. what is the rate in the pound. Ans 1d 1/2

$$\begin{array}{r} \text{L} \quad \text{S} \quad \text{D} \quad \text{P} \quad \text{L} \\ 1750 : 32 : 16 : 3 :: 1 \\ \hline 20 \quad 20 \quad 20 \\ 35000 \quad 656 \quad 12 \quad 212 \\ \hline 1120000 \quad 7875 \quad 240 \\ \hline 315000 \quad \text{P} \\ 15750 \\ \hline 11890000 \quad 1112 \text{ Ans} \\ 1680000 \\ \hline 210000 \quad 211 \\ \hline 840000 \quad 211 \\ 8110000 \end{array}$$

8 Bought three tons of oil for 151l 11s 8d gallons of which being damaged I desire to know how I may sell the remainder per gallon so as neither to gain nor lose thereby

$$\begin{array}{r} \text{Ans} \quad 115 \quad 6 \frac{1}{4} \text{ gal} \\ 3 : 151 : 11 : 8 \frac{1}{2} :: 1 \\ \hline 48 \quad 19034 \quad 115 \quad 6 \frac{1}{4} \text{ Ans} \\ 36 \quad 2684 \\ \hline 72 \quad 350 \\ 756 \quad 12 \\ \hline 85 \quad 1200 \quad 6 \text{ P} \\ 671 \quad 4076 \\ \hline 174 \\ \hline 686 \quad 11 \\ 671 \end{array}$$

9 If the carriage of 5c. will for 96 miles be 3256d how far may I have 3c. 19d carriage for the same money?

$$\begin{array}{r} \text{Ans} \quad 151 \text{ M. } 3 \text{ fur. } 3 \text{ B.} \\ \text{c} \quad \text{d} \quad \text{M} \quad \text{c} \quad \text{fur} \\ 5 : 11 : 96 :: 3 : 1 \\ \hline 4 \quad 4 \\ 20 \quad 13 \\ \hline 28 \quad 28 \\ 174 \quad 104 \\ \hline 40 \quad 264 \\ 576 \quad 364 \\ \hline 3444 \\ 5166 \quad 151 \text{ M} \\ 55104 \\ \hline 364 \\ 1820 \\ \hline 504 \\ 140 \quad 3 \text{ fur} \\ \hline 11092 \quad 3 \text{ P} \\ 11092 \end{array}$$

10 Bought 200 yards of cambric for 70^l which being damaged am willing to lose 7^l 10^s by the whole at what rate then must it sell per ell English Ans 103 3d 3/4

$$\begin{array}{r} \text{yds } 90 \text{ } \text{£ } 7 \text{ } 10 \text{ } \text{Ell} \\ 200 : 82 \text{ } 10 :: 1 \\ \hline 800 \text{ } 1650 \text{ } \text{£ } 10 \text{ } 3 \frac{3}{4} \text{ Ans} \\ 800 \text{) } 8250 \\ \underline{800} \\ 250 \\ \hline 2000 \text{ } (3 \\ \underline{2400} \\ 600 \\ \hline 2400 \text{ } (3 \frac{3}{4} \\ \underline{2400} \end{array}$$

11 If for 48^s 22^d 5^c. be carried 512 miles how many hundred weight may be carried 64 miles for the same money Ans 1800^c

$$\begin{array}{r} \text{cwt } \text{cwt } \text{cwt} \\ 512 : 225 :: 64 \\ \hline 512 \\ \underline{1125} \\ 1125 \text{ cwt} \\ 64 \text{) } 115200 \text{ (1800 Ans} \\ \underline{64} \\ 512 \\ \underline{512} \\ 00 \end{array}$$

12 Bought a parcel of cloth at the rate of 6^s 6^d. for every two yards of which a certain quantity was sold at the rate of 18^s 9^d. for every five yards and gained thereby as much as 180 yds cost; how many yards were sold Ans 1140 yards

$$\begin{array}{r} \text{£ } \text{£ } \\ 2) 6 \text{ } 6 \\ \underline{3 \text{ } 3} \\ 3 \end{array} \quad \begin{array}{r} \text{£ } \text{£ } \\ 5) 18 \text{ } 9 \\ \underline{3 \text{ } 3} \\ 6 \end{array} \quad \begin{array}{r} \text{£ } \text{£ } \\ 6 \text{ } 6 \\ \underline{12} \\ 78 \\ 180 : 90 \\ \hline 2 \end{array}$$

$$6 : 1 :: 7020$$

$$\begin{array}{r} 7020 \\ \underline{1140} \text{ Ans} \end{array}$$

13 A certain steeple projected upon level ground a shadow to the distance of 633 ft in when a staff 3 feet in length perpendicularly erected cast a shadow 6 ft. in from hence the height of the steeple is required.

$$\begin{array}{r} \text{ft in } \text{ft } \text{Ans } 100 \text{ yds} \\ 6 \text{ } 11 : 3 :: 633 \text{ } 11 \\ \hline 12 \\ 76 \end{array} \quad \begin{array}{r} 7600 \text{ } (3 \\ 76 \text{) } 22800 \text{ (300} \\ \underline{22800} \end{array}$$

14 If 12 yards of yard wide stuff exactly line 8 yards of silk of another breadth: how many yards of the latter will line 24 pieces of the former each piece containing 20 yards? Ans 320 yards.

$$\begin{array}{r} \text{yds } \text{yds } \text{yds} \\ 12 : 8 :: 24 \\ \hline 128 \\ 13840 \text{ Ans} \\ \underline{320} \end{array}$$

15 Laid out 100^l. upon serges and shalloons: the value of the shalloons was 60^l and the quantity of serge 237 yards also for every two yards of serge there were three of shalloon how many yards of shalloon were there and what was the value of one yard of each sort. Ans 355 1/2 yds. shalloon 38 11d 1/2 + each per yard

$$\begin{array}{r} 100 \text{ yds} \\ 60 \\ \hline 110 : 237 :: 60 \\ 110 \overline{) 11220} \\ 355 \frac{1}{2} \text{ yards} \end{array}$$

$$\begin{array}{r} 237 \overline{) 800} \quad (38 \text{ ells}) \\ 711 \\ \hline 89 \\ 12 \\ \hline 1068 \quad (11 \text{ p}) \\ 912 \\ \hline 120 \\ 1180 \quad (2 \frac{1}{2}) \\ \hline 1174 \end{array}$$

16 How many pieces of Holland each 33 ells Flemish 199 2 na may be had for 118 l 17 s 7 1/2 d when 11 ells English cost 1 l 15 10 d Ans 16 pieces 33 ells 199

$$\begin{array}{r} 1 \text{ l } 15 \text{ s } 10 \text{ d} : 11 :: 118 \text{ l } 17 \text{ s } 7 \frac{1}{2} \text{ d} \\ 20 \\ 27 \\ 12 \\ \hline 334 \\ 11 \\ \hline 1336 \end{array}$$

$$\begin{array}{r} 1336 \overline{) 115650} \quad (11 \text{ ells English}) \\ 11008 \\ \hline 5570 \\ 5344 \\ \hline 2264 \\ 1336 \\ \hline 928 \\ 3 \text{ qrs} \end{array}$$

$$\begin{array}{r} 11640 \quad (3 \text{ qrs}) \\ 11008 \\ \hline 632 \\ 12528 \quad (1 \text{ na}) \end{array}$$

$$\begin{array}{r} 1102 \overline{) 1708} \quad (16 - 33 - 1 - 1 \text{ Ans}) \\ 1702 \\ \hline 6833 \\ 1102 \\ \hline 2813 \\ 2112 \\ \hline 1101 \text{ Remainder} \\ 1100 \\ \hline 3100 \\ 3311 \\ \hline 1101 \text{ ells qrs na} \end{array}$$

17 A factor bought 64 pieces of Holland which cost him 352 l. at 5 s 6 d. per ell Flemish: how many yards were there in all and how many ells English in each piece Ans 760 yds. 12 ells each piece.

$$\begin{array}{r} 5 \text{ s } 6 \text{ d} : 1 :: 352 \\ 12 \\ \hline 66 \\ 70 \frac{1}{2} \text{ ells} \\ 184180 \quad (1280) \end{array}$$

$$\begin{array}{r} 184 \\ 132 \\ \hline 528 \\ 528 \\ \hline 1280 \end{array}$$

$$\begin{array}{r} 11 \overline{) 3840} \\ 960 \text{ yds Ans} \end{array}$$

$$\begin{array}{r} 1280 \\ 3 \\ \hline 573840 \\ 12 \text{ ells each} \\ \hline 768 \quad (12 \text{ ells each}) \\ 64 \\ \hline 128 \\ 128 \end{array}$$

18 Off a pole perpendicular to the horizon of 50 ft. 11 in. in length when the sun is on the meridian cast a shadow 98 feet 6 in. long; what is the breadth of a river that running due east and west within 20 ft. 6 in. on the north side of the foot of a steeple, 300 ft. 8 in. high which at the same time casts the extremity of its shadow 30 ft. 9 in. beyond the stream Ans 176 yds. 2 ft. 11 in.

$$\begin{array}{r} 611 \overline{) 4264656} 6979 \\ \underline{3666} \end{array}$$

feet in

$$\begin{array}{r} 20 \text{--} 6 \\ 30 \text{--} 9 \\ \hline 51 \text{--} 3 \\ 12 \\ \hline 615 \end{array}$$

in

$$\begin{array}{r} 5499 \\ 4875 \\ 4277 \\ \hline 5986 \\ 5499 \\ \hline \hline \end{array}$$

6979

in
6772
615
12)6364(—11
3)530—11
176—11
yds 176

$$\begin{array}{r} 7\frac{1}{2} : 1 :: 144 \\ \hline 2 \end{array}$$

$$\begin{array}{r} 15 \overline{) 5760} \\ \underline{45} \\ 126 \\ \underline{120} \\ 60 \\ \underline{60} \end{array}$$

16 day $\frac{20}{2}$
 5: 1 :: $\frac{109}{1}$
 3100
 20 dys
 20
 40
 500 Miles

$$\begin{array}{r} 58 \\ 13 \overline{) 151230} \\ 15113 \\ \hline 80 \\ 13 \overline{) 800} \\ 15113 \\ \hline 20 \end{array}$$

Ans 5 min. 20 sec.

M M M M

10 20 110 80

20

200

110

8000

80

M

10 ÷ 640000

20 ÷

110 ÷

80 ÷

64000
32000
16000
8000

M

120000 : 1 :: 640000 m.s.

640000

600000

40000

60

2400000

2400000

0

23 Astronomers compute the
earth's orbit or track which
it describes round the sun in
365 days 6 hours to be about
596900000 miles: how far
then per minute must we
be carried through the
firmament by this won-
derful motion Ans
1134+ miles

days 36
 365 6
 24
 1466
 730
 8766 60 Miles M
 $525960 : 596900009 :: 1$

$$\begin{array}{r} 59690000 \\ 525960 \overline{) 59690000} \\ 709400 \\ 525960 \\ 1834400 \\ 15778800 \\ 25652000 \\ 21038110 \end{array}$$
 1134+ miles
 Ans

24 Isaac Newton and others have found by nice experiments that sound flies at the rate of 1142 feet per second and a person in health has about 75 beats of the artery or pulsations in a minute: now the breadth of a river is required at one side of which A. firing a gun B. directly opposite at the other counts six pulsations at his wrist between seeing the flash and hearing the report Ans 5481 ft. or 1 mile 201

ft
 Puls 11420 Pulsations
 $75 : 68520 :: 6$
 $75 \overline{) 411120} (5481 \text{ ft. Ans}$

$$\begin{array}{r} 352 \\ 361 \\ 300 \\ 612 \\ 600 \\ 120 \end{array}$$

 ft ft
 $5280 \overline{) 5481} (1 \text{ mile } 201 \text{ ft}$

$$\begin{array}{r} 5280 \\ 201 \end{array}$$
 Ans

25 If the report of a piece of ordinance be heard one minute and three seconds after the flash was observed: the distance is required. Ans 13 mils 5 furlongs.

sec ft M sec
 $1 : 1142 :: 1 \frac{3}{60}$

$$\begin{array}{r} 3426 \\ 63 \overline{) 1142} \\ 63 \\ 512 \\ 5280 \end{array}$$

$$\begin{array}{r} 71946 \\ 5280 \overline{) 71946} \\ 19146 \\ 15840 \\ 3306 \\ 3300 \\ 660 \end{array}$$
 13 miles
 5 furlongs

Last Sum

Double Rule of Three

Suppose 11 men in 12 days mow 118 acres: how many acres can 8 men mow in 16 days?
Ans 128 acres.

$$\begin{array}{r}
 11m \quad \text{A} \quad 8m \\
 12d \quad \text{B} \quad 118 \quad \text{C} \quad 16d \\
 118 \\
 \hline
 128 \\
 118 \\
 \hline
 1024 \\
 512 \\
 118 \overline{) 6144} \quad (128 \text{ acres} \\
 118 \\
 \hline
 134 \\
 96 \\
 \hline
 384 \\
 384 \\
 \hline
 0
 \end{array}$$

3 If 12 oxen in 16 days eat 20 acres of grass: how many acres will serve 21 oxen 118 days. Ans 120 acres.

$$\begin{array}{r}
 12ox \quad \text{A} \quad 21ox \\
 16d \quad \text{B} \quad 20 \quad \text{C} \quad 118d \\
 20 \\
 \hline
 192 \\
 96 \\
 \hline
 1152 \quad \text{A} \\
 20 \\
 \hline
 23040 \quad (120 \text{ acres} \\
 192 \\
 \hline
 384 \\
 384 \\
 \hline
 0
 \end{array}$$

11 If 10 bushels of oats be sufficient for 18 horses 20 days: how many bushels will serve 60 horses 36 days at that rate
Ans 60 bushels.

$$\begin{array}{r}
 18h \quad \text{A} \quad 60h \\
 20d \quad \text{B} \quad 10 \quad \text{C} \quad 36d \\
 360 \\
 \hline
 2160 \\
 18 \overline{) 21600} \quad (60 \text{ bush} \\
 180 \\
 \hline
 2160 \\
 2160 \\
 \hline
 0
 \end{array}$$

5 If 56 lb. of bread be sufficient for 7 men 14 days: how many pounds will suffice 21 men 3 days. Ans 36 lb.

$$\begin{array}{r}
 7m \quad \text{A} \quad 21m \\
 14d \quad \text{B} \quad 56 \quad \text{C} \quad 3d \\
 56 \\
 \hline
 63 \\
 56 \\
 \hline
 378 \\
 315 \\
 \hline
 3528 \quad (36 \text{ lb. Ans} \\
 294 \\
 \hline
 588 \\
 588 \\
 \hline
 0
 \end{array}$$

6 If 8 men have 36 lbs. for 14 days work: how much ought 18 men to receive for 16 days. Ans 76 lb 16 s.

$$\begin{array}{r}
 8m \quad \text{A} \quad 18m \\
 14d \quad \text{B} \quad 36 \quad \text{C} \quad 16d \\
 36 \\
 \hline
 64 \\
 288 \\
 48 \\
 \hline
 768 \\
 64 \\
 \hline
 3072 \\
 4608 \\
 \hline
 32 \overline{) 49152} \quad (76 \text{ lb } 16 \text{ s} \\
 32 \\
 \hline
 171 \\
 160 \\
 \hline
 115 \\
 96 \\
 \hline
 192 \\
 192 \\
 \hline
 0
 \end{array}$$

7 If 700 dols. in half a year raise 14 dols. interest: what will be the interest of 400 dols. for 5 years? Ans. 80 dols.

$$\begin{array}{r}
 700d \quad \text{A} \quad 400d \\
 1/2y \quad \text{B} \quad 14 \quad \text{C} \quad 5y \\
 350 \\
 \hline
 2000 \text{ dols} \\
 14 \\
 \hline
 350 \overline{) 28000} \quad (80 \text{ dols} \\
 2800 \\
 \hline
 2800 \\
 2800 \\
 \hline
 0
 \end{array}$$

8 If 112 acres of grass be mowed by 16 men in 7 days: how many acres may 24 men mow in 14 days.

Ans 1156 acres.

$$\begin{array}{r} 16m \quad 7d \quad 112 \\ 24m \quad 14d \quad 1156 \\ \hline 112 \quad 216 \\ 24 \quad 456 \\ 112 \quad 912 \\ 456 \quad 1156 \\ 112 \quad 51072 \quad 1156 \\ \hline 1118 \quad \text{Ans} \\ 627 \\ 560 \\ \hline 672 \end{array}$$

9 If 16l 18s. be the wages of 16 men for 8 days: what sum will 32 men earn in 24 days? Ans 101l 8s.

$$\begin{array}{r} 16m \quad 8d \quad 16l \quad 18s \\ 32m \quad 24d \quad 101l \quad 8s \\ \hline 128 \quad 338 \quad 128 \\ 64 \quad 768 \\ 338 \quad 6144 \\ 2304 \quad 2028 \\ 128 \quad 259584 \quad 2028 \\ \hline 256 \quad 1018 \\ 358 \quad 1024 \\ 256 \quad 1024 \\ \hline 1024 \quad \text{Ans} \end{array}$$

10 If 75l. in 9 months amount to 78l 7s 6d. at what rate percent is the interest computed Ans 6l. per cent

$$\begin{array}{r} 75l \quad 9m \quad 78l \quad 7s \quad 6d \\ 100l \quad 12m \\ \hline 675 \quad 81200 \quad 11110 \\ 675 \quad 972000 \quad 20120 \\ \hline 2970 \quad 675 \quad \text{Ans} \\ 2700 \\ 2700 \end{array}$$

11 Suppose the wages of 6 persons for 21 weeks be 120l what will be the hire of 111 persons for 146 weeks. Ans 613l 6s 8d.

$$\begin{array}{r} 6l \quad 21w \quad 120 \\ 126 \end{array}$$

$$\begin{array}{r} 126 \quad 84 \\ 56 \quad 644 \\ 12880 \\ 644 \quad 2880 \\ 126 \quad 77280 \quad 613l \quad 6s \quad 8d \\ \hline 756 \quad \text{Ans} \\ 168 \\ 420 \\ 378 \\ 420 \\ 126 \quad 840 \quad 6s \\ \hline 756 \quad 84 \\ 12 \quad 1008 \quad 8d \end{array}$$

12 What is the interest of 257l 13s 5d. for 20 weeks at 5 per cent? Ans 11l 19s 10d

$$\begin{array}{r} 52w \quad 20w \quad 2 \\ 100l \quad 5 \quad 257l \quad 13s \quad 5d \\ \hline 2000 \quad 5193 \\ 24000 \quad 62321 \\ 48000 \quad 124642 \\ 120000 \quad 1248000 \\ 1248000 \quad 16232100 \quad 11l \\ \hline 4992000 \quad 1240100 \\ 124802000 \quad 19s \\ \hline 1248000 \quad 12322000 \\ 11232000 \quad 1090000 \quad 10d \\ \hline 13080000 \quad 600000 \quad 14s \\ \hline 2400000 \quad 1248000 \end{array}$$

13 If 2 men can do 12 rods of ditching in 6 days: how many rods may be done by 8 men in 24 days. Ans 192 rods.

$$\begin{array}{r} 2m \quad 6d \quad 12r \\ 8m \quad 24d \quad 192r \\ \hline 192 \quad 12 \\ 12 \quad 2304 \\ \hline 192 \quad \text{Ans} \end{array}$$

SS

11 If the carriage of 8 cwt.
128 miles cost 6.40; what mu
st be paid for the carriage
of 11 cwt. 32 miles. Ans 80cts

$$\begin{array}{r} \text{8 cwt} \} \text{26} \} \text{11 cwt} \\ 128 \text{ m} \} 6.40 \} 32 \text{ m} \\ \hline 1024 \end{array}$$

$$\begin{array}{r} 128 \\ 640 \\ \hline 5120 \\ 768 \\ \hline 8192 \end{array}$$

Ans 80cts

15 If 200 lb be carried 40
miles for 10 cts. how much
must be paid at that rate
for the carriage of 20200 lb.
60 miles. Ans 60,60 cts

$$\begin{array}{r} 200 \text{ lb} \} \text{6} \} 20200 \text{ lb} \\ 40 \text{ m} \} 10 \} 60 \text{ m} \\ \hline 8000 \end{array}$$

$$\begin{array}{r} 1212000 \\ 40 \\ \hline 14848000 \end{array}$$

Ans 60,60 cts

16 If the freight of 9 hogs
heads of sugar each weighing
12 hundred weight for 20 le
agues cost 16. what must be
paid for the freight of 50 ea
shs of of ditto each weighing
142 hundred weight 100 leagues
Ans 92.115 10 D

$$\begin{array}{r} 9 \times 12 = 108 \text{ cwt} \} \text{125} = 212 \times 50 \\ 20 \text{ l} \} 16 \} 100 \text{ leagues} \\ \hline 2160 \end{array}$$

$$\begin{array}{r} 12500 \\ 16 \\ \hline 75000 \\ 12500 \\ \hline 200000 \end{array}$$

$$\begin{array}{r} 2160 \} 200000 \} 92-11-10 \\ 19440 \} \text{Ans} \\ \hline 56000 \\ 4320 \\ \hline 12820 \\ 25600 \} 11 \text{ S} \\ \hline 2160 \\ 4000 \\ \hline 2160 \\ 1840 \\ \hline 122080 \} 10 \text{ D} \\ \hline 2160 \\ \hline 480 \end{array}$$

SSS INVERSE proportion

2 If 4 dollars be the hire of
8 men for three days: how m
any days must 20 men work for
10 dollars Ans. 12 days

$$\begin{array}{r} 4 \text{ d} \} \text{days} \} 4 \text{ d} \\ 8 \text{ m} \} 3 \} 640 \text{ m} \\ \hline 20 \\ \hline 80 \end{array}$$

$$\begin{array}{r} 320 \\ \hline 1960 \end{array}$$

Ans 12

3 If 11 men have 7 shillings
for three days work: how many
men will earn 4.165. in 16 days.
Ans 3 men

$$\begin{array}{r} 24 \text{ s} \} \text{men} \} 96 \text{ s} = 4.16 \\ 3 \text{ d} \} 11 \} 16 \text{ d} \text{ S} \\ \hline 16 \end{array}$$

$$\begin{array}{r} 144 \\ 24 \\ \hline 384 \end{array}$$

$$\begin{array}{r} 3 \\ \hline 288 \\ \hline 1152 \end{array}$$

3 men ans

11 Suppose the interest of 333.6.38
for 9 months be 156 what prin
cipal in 12 months will gain 6
Ans 100. S

$$\begin{array}{r} 15 \text{ s} \} \text{333-6-38} \} 6 \text{ s} \\ 9 \text{ m} \} 20 \} 12 \text{ m} \\ \hline 54 \end{array}$$

$$\begin{array}{r} 80000 \\ 180 \} 320000 \} 24000 \\ \hline 360 \end{array}$$

$$\begin{array}{r} 720 \\ \hline 720000 \end{array}$$

Ans

5 If 200 lb. be carried 40 miles for
10 cts: how far may 20200 lb be
carried for 60,60. Ans 60 miles.

$$\begin{array}{r} 200 \text{ lb} \} \text{miles} \} 10 \text{ cts} \\ 40 \text{ cts} \} 40 \} 60,60 \text{ cts} \\ \hline 20200 \\ 40 \\ \hline 80800 \end{array}$$

$$\begin{array}{r} 1212000 \\ 40 \text{ miles} \\ \hline 148480000 \} 60 \\ \hline 4848000 \end{array}$$

Ans

6 If 115 men can make a wall 32 feet high and 40 feet long in 8 days: in how many days can 68 men build a wall 28 feet high of the same length

Ans 114 days 11 h +

$$\begin{array}{r}
 115 \text{ m } \{ \begin{array}{l} 32 \text{ ft} \\ 40 \text{ ft} \end{array} \} 8 \text{ days} \{ \begin{array}{l} 68 \text{ m} \\ 28 \text{ ft} \end{array} \} \\
 \hline
 68 \\
 256 \\
 192 \\
 \hline
 2176 \\
 \hline
 115 \\
 28 \\
 \hline
 1160 \\
 290 \\
 \hline
 4060 \text{ days} \\
 32480 \text{ (114 days)} \\
 2176 \\
 \hline
 10720 \\
 8704 \\
 \hline
 2016 \\
 12 \\
 \hline
 24192 \text{ (11 h +)} \\
 2176 \\
 \hline
 2432 \\
 2176 \\
 \hline
 \end{array}$$

7 If a footman when the days are 11 hours long can travel 276 miles in 16 days: in how many days can he travel 852 miles when the days are but 12 hours long: Ans 57 days 7 hours +

$$\begin{array}{r}
 11 \text{ h } \{ \begin{array}{l} 276 \text{ m} \\ 16 \end{array} \} \{ \begin{array}{l} 12 \text{ h} \\ 852 \text{ m} \end{array} \} \\
 \hline
 12 \\
 3312 \\
 \hline
 11 \\
 3408 \\
 852 \\
 \hline
 11928 \\
 16 \\
 \hline
 71568 \\
 11928 \\
 \hline
 1190848 \text{ (57 days)} \\
 16560 \\
 \hline
 25248 \\
 23184 \\
 \hline
 2064 \\
 12 \\
 \hline
 24768 \text{ (7 hours)} \\
 23184 \\
 \hline
 \end{array}$$

8 If 15 men eat 3 shillings worth of bread in 6 days when wheat is sold at nine shillings per bushel: how many days will 30 men require to eat 135 11d. worth when wheat is at 6s. per bushel. Ans 20 days.

$$\begin{array}{r}
 3 = 36d \{ \begin{array}{l} 15 \text{ m} \\ 6 \end{array} \} \{ \begin{array}{l} 160d \\ 13-11 \end{array} \} \\
 \hline
 15 \text{ m } \{ \begin{array}{l} 6 \\ 30 \text{ m} \end{array} \} \{ \begin{array}{l} 15 \\ 2400 \end{array} \} \\
 \hline
 30 \\
 1080 \\
 6480 \\
 \hline
 11400 \\
 95 \\
 \hline
 1129600 \text{ (20 days)} \\
 12960 \\
 \hline
 \end{array}$$

9 If 100l. principal in 12 months gain 8l. interest: what principal will gain 8l. 12s. in 5 months. Ans 258l

$$\begin{array}{r}
 100 \text{ l } \{ \begin{array}{l} 12 \text{ m} \\ 8 = 160s \end{array} \} \{ \begin{array}{l} 5 \text{ m} \\ 8-12 \end{array} \} \\
 \hline
 800 \\
 206400 \\
 \hline
 206400 \\
 258 \text{ l } \text{ Ans}
 \end{array}$$

10 Suppose 100l. will defray the expenses of 5 men for 22 weeks and 6 days: how long will 12 men be spending 150 l. Ans 11 weeks 2 days.

$$\begin{array}{r}
 100 \text{ l } \{ \begin{array}{l} 22 \text{ weeks} \\ 6 \end{array} \} \{ \begin{array}{l} 150 \text{ l} \\ 12 \text{ m} \end{array} \} \\
 \hline
 5 \text{ m } \{ \begin{array}{l} 22 \\ 7 \end{array} \} \{ \begin{array}{l} 12 \text{ m} \\ 5 \end{array} \} \\
 \hline
 12 \\
 1200 \\
 160 \\
 \hline
 750 \\
 160 \\
 \hline
 115000 \\
 750 \\
 \hline
 1120000 \\
 1100 \\
 \hline
 11100 \text{ (11 weeks 2 days)} \\
 11100 \text{ Ans}
 \end{array}$$

Application.

1 If 7 bushels of malt be sufficient for 7 persons 11 months how many bushels will serve 116 persons 10 months. Ans 115 bushels.

$$\begin{array}{r} 7b \quad \} \quad B \quad \} \quad 116b \\ 11m \quad \} \quad 7 \quad \} \quad 10m \\ \hline 28 \quad \quad \quad 460 \\ \hline 3220 \quad (115 \text{ bushels}) \\ 28 \quad \quad \quad 42 \\ \hline 110 \end{array}$$

2 How many men must be employed to reap 210 acres in 12 days if 36 men can reap 60 acres in 5 days.

Ans 60 men.

$$\begin{array}{r} 60 \text{ men} \quad \} \quad 240 \text{ d} \\ 5d \quad \} \quad 36 \quad \} \quad 12 \\ \hline 12 \quad \quad \quad 5 \\ \hline 720 \quad \quad \quad 1200 \\ \hline 7200 \\ \hline 3600 \\ \hline 43200 \quad (60 \text{ men}) \\ 43200 \quad \text{Ans} \end{array}$$

3 If 5 men make 300 pair of shoes in 40 days how many men may make 900 pair in 60 days. Ans 10 men.

$$\begin{array}{r} 300 \text{ pair} \quad \} \quad 5 \text{ men} \quad \} \quad 900 \text{ pair} \\ 40d \quad \} \quad 5 \quad \} \quad 60d \\ \hline 60 \quad \quad \quad 40 \\ \hline 18000 \quad \quad \quad 36000 \\ \hline 180000 \\ \hline 10 \text{ men} \quad \text{Ans} \end{array}$$

4 A porter having received 112 shillings for the carriage of 3c. wt. 150 miles. how much ought he to have for the conveyance of 7c. 2qr. 11lb. 50 miles? Ans 35s 7d.

$$\begin{array}{r} \text{cwt} \quad 3 = 336 \text{ lb} \quad \} \quad S \quad \} \quad 85 \text{ lb} = 7 \text{ s } 2 \text{ d } 11 \text{ lb} \\ 150 \text{ m} \quad \} \quad 112 \quad \} \quad 50 \text{ m} \\ \hline 16800 \quad \quad \quad 42700 \\ 336 \quad \quad \quad 112 \\ \hline 50400 \quad \quad \quad 85400 \\ \hline 170800 \\ \hline 1793400 \quad (35 \text{ s}) \\ 154200 \\ \hline 281400 \\ 252000 \\ \hline 29400 \\ \hline 352800 \quad (7 \text{ d}) \\ 352800 \end{array}$$

5 A person having engaged to remove 8000c. wt. a certain distance in 9 days. with 18 horses in 6 days he removed 4500cwt. how many horses will be required to remove the remainder in the remaining 3 days. Ans 28 horses.

$$\begin{array}{r} 8000 \text{ cwt} \quad \} \quad \text{horses} \quad \} \quad 8000 \\ 4500 \text{ cwt} \quad \} \quad 18 \quad \} \quad 4500 \\ 6d \quad \} \quad 18 \quad \} \quad 3d \\ \hline 3 \quad \quad \quad 6 \\ \hline 13500 \quad \quad \quad 21000 \\ \hline 168000 \text{ horses} \\ 21000 \\ \hline 378000 \quad (28 \text{ horses}) \\ 27000 \quad \text{Ans} \\ \hline 108000 \\ 108000 \end{array}$$

6 If 20 hundred weight be carried 50 miles for 5s how much will forty hundred weight cost to be conveyed 100 miles Ans 20s.

Practice

2 Bought 97. 19c. 3 gr. 27
lb. 3/4 of iron, at 39l 19s 11d. 1/2
per ton; what was the amount
Ans 399l. 19s 11d. 1/2

39-19-11 1/2

cwt	lb	gr	Ans
10	1/2	359	19 7 1/2
4	1/2	19	19 11 3/4
4	1/2	7	19 11 3/4
1	1/2	7	19 11 3/4
grs	1/2	1	19 11 3/4
1	1/2	0	19 11 3/4
1	1/2	0	19 11 3/4
lb	1/2	0	19 11 3/4
7	1/2	0	19 11 3/4
4	1/2	0	19 11 3/4
2	1/2	0	19 11 3/4
3 1/4	1/2	0	19 11 3/4
1/4	1/2	0	19 11 3/4

399-19-11 Ans

Tare and Tret

2 what is the neat weight of
456c. 19p. 19 lb. of tobacco tare
in the whole 15c. 29p. 13 lb.
and what is the amount there
of at 1l 15s 8d. per cwt Ans
neat 440c. 39p 6 lb. amount
786l 13 11d 3/4

cwt	gr	lb	Ans
456	19	19	15 2 13
15	2	13	440-3-6
1	15	8	17 16 8
1	15	8	17 16 8
4	2	178	6 8 4
2	7	713	6 8 8
2	7	71	6 8 8
		17	10
		8	11
		1	3 1/4
		0	7 1/2
		786	1 11 3/4

3 How much is the neat weight
of 36 hogsheads of tobacco weigh-
ing gross 201c. 39p. 12 lb. tare in
the whole 3140 lb. and what does
it come to at 1l 17s 6d. per hun-
dred weight Ans neat 173c. 39p.
8 lb. value 325l 18s 3d 1/2

lb	Ans
112) 3140	201-3-12
224	28-0-11
900	173-3-8
896	

lb L S D cwt gr lb
112 : 1-17-6 :: 173-3-8

2 What is the neat wei
ght and value of 40 hogs of
figs gross 75c. 39p. 14 lb tare
per hundred weight 14 lb at
18s 6d. per cwt Ans neat
66c. 19p. 16 lb value 6l 8s 3d

$\frac{112}{112} : \frac{18}{18} : \frac{6}{6} :: \frac{66}{66} : \frac{1}{1} : \frac{16}{16}$
 lb 3 8 11 1/2 cwt gr lb
 75-3-14
 9 1 26

3 Told 9 hogsheads of sugar
 each 60.2 gr 12 lb. gross tare
 per hundred weight 17 lb wh
 at is the neat weight. and wh
 at does it amount to at 2 l
 12 s 6 d per hundred weight
 Ans neat 50 c 1 gr 22 lb amou
 nt 132 l 8 s 5 d 1/4 cwt gr lb
 59-1-21 6-2-12
 9 0 2 ~~100~~ 59-1-21
 50 1 22 neat 59-1-21

$\frac{112}{112} : \frac{2}{2} : \frac{15}{15} :: \frac{11}{11} : \frac{39}{39} : \frac{0}{0} : \frac{25}{25} : \frac{12}{12}$
 lb 2 5 10 cwt gr lb
 112 : 2-15-11 :: 39-0-25-12
 237
 28
 1900
 476
 6660 36
 46620 9-0-2
 6660
 112) 113220 1010
 112 84
 122 170
 112 168

lb 2 5 10 cwt gr lb
 112 : 2-12-6 :: 50-1-22

11 Bought 11 hogsheads of
 sugar weighing 113 c. 3 gr
 21 lb gross tare 12 lb per
 hundred weight required
 the neat weight and its va
 lue at 2 l 15 s 4 d per hund
 red weight Ans neat
 39 c 2 s 12 0 1/2 value 108 l
 10 s 7 d 3/4 cwt gr lb

113-3-21
 4 cwt gr lb 0 2
 125 113-3-21-0
 28 4-2-23-4
 1401 39 0-25-12
 352
 4921 12 neat ans
 59052

112) 59052 (28) 527 (18)
 560 28
 305 247
 224 221
 812 23
 7811
 28
 168
 28
 7448 (1107)

lb 2 5 10 cwt gr lb 0 2
 112 : 2-15-11 :: 39-0-25-12

Case 4

2 In 8 c 3 gr 20 lb. gross tare
 38 lb trett 11 lb in every 100 lb
 how many pounds neat: and wh
 at do they come to at 8 d per lb
 Ans neat 925 lb. value 32 l 15 s

2 d 1/2 cwt gr lb
 8-3-20

35
 28
 280
 72
 gross 1000
 tare 38
 subtle 962
 trett 37
 neat 925
 lb 1 lb
 1 : 8 1/2 :: 925

3 Bought 120 c 2 gr. gross of
 sugar: tare 176 lb trett 11 lb per
 100 lb what is the neat weig
 ht and its value at 2 l
 2 s 8 d per hundred weight
 Ans neat 111 c 1 gr 12 lb
 value 219 l 13 s 6 d 1/4

cwt gr lb
 120-2-0
 482
 28
 3856 26)13320(512
 964 130
 13496 32
 176 tare 26
 13320 60
 512 52
 212808 457
 8112 114-1-12
 160 neat
 140
 208
 196

lb L S P cwt gr lb
 112: 2-3-8 :: 114-1-12

lb
 19846
 1594 tare
 18252
 702 trett
 28)17550(4626
 168 156-2-22
 75 neat
 56
 190
 168
 22

11 Sold 177c. 22 lb
 gross tare 9 lb. per hun
 dred weight trett 11 lb. per
 104 lb required the neat
 weight and its amount at
 3l 11s. per hundred wei
 ght Ans neat 156c
 2 gr 22 lb amount 579l 15s
 6d 4

cwt lb
 177-22
 708
 28 26)18252(702
 182 52
 5666 52
 1418 52
 19846
 112)178614(1594
 112
 666
 560
 1061
 1008
 534
 448
 86

lb L S P cwt gr lb
 112: 3-14 :: 156-2-22

Simple Interest

2 What is the interest of 87l
 11s 5d for one year at 6 perce
 nt per annum. Ans 5l 5s 3d
 L S P
 87-11-5
 100/526-6-6
 500 5l
 26 5s
 20 3d
 1526 5l
 500
 26
 12
 1318 3l
 300

3 What is the amount of
 173l 17s 8 1/2 for a year at 7
 percent per annum. Ans
 186l 15s 1d 3/4
 L S P
 173-17-8 1/2
 12-3-5 1/4
 100/1217-3-11 1/4
 100 122
 217 122
 200
 17
 20
 1313 3
 300
 43
 12
 1527 5
 200
 27
 110 1/4
 100
 10

11 What will a bond for 176l
13s 9d amount to in nine years
at 5 per cent per annum

Ans 256l 3s 11d $\frac{1}{4}$

$$\begin{array}{r} \text{L } 176-13-9 \\ \text{S } 8-16-8\frac{1}{4} \\ \hline 100 \overline{) 883-8-9} \\ \underline{800} \quad (8 \\ 83 \quad (8 \\ \underline{20} \quad 79-10-2\frac{1}{4} \\ 176-13-9 \\ \hline 1668 \quad (16 \text{ S } 256-3-11\frac{1}{4} \text{ Ans} \\ \underline{100} \\ 668 \\ \underline{600} \\ 68 \\ \underline{12} \\ 1825 \quad (8 \text{ S } \\ \underline{800} \\ 25 \\ \underline{4} \\ 1100\frac{1}{4} \end{array}$$

Case 2. SSS

2 Calculate the interest of a
bond for 1127l 18s 9d for 2 years
at 5 $\frac{3}{4}$ per cent per annum

Ans 119l 11s 3d $\frac{1}{2}$

$$\begin{array}{r} 3\frac{1}{4} \overline{) 1127-18-9} \\ \underline{1127-18-9} \\ 2139-14-9 \\ \underline{213-19-11\frac{1}{2}} \\ 106-19-8\frac{1}{4} \\ \hline 2160 \quad 13-7\frac{3}{4} \\ \underline{2} \\ 49\frac{1}{2} \quad 1-7-3\frac{1}{2} \end{array}$$

$$\begin{array}{r} \text{L } 49\frac{1}{2} \quad 20 \\ \text{S } 4\frac{1}{2} \quad 12 \\ \hline \text{Ans } 119\frac{1}{2} \end{array}$$

3 What sum will 1096l 15s 8d
amount to in 11 years at 6 $\frac{1}{2}$
per cent per annum. Ans

1381l 18s 8d

$$\begin{array}{r} \text{L } 1096-15-8 \\ \text{S } 6580-13-0 \\ \text{S } 518-7-9 \\ \hline 1381-18-8\frac{3}{4} \text{ Ans} \\ \hline 1096-15-6 \\ 285-3-2\frac{3}{4} \\ \hline 1381-18-8\frac{3}{4} \end{array}$$

Case 3 SSS

2 What is the interest of 57l 17s
8d for three months at 6 per cent
per annum Ans 17s 11d $\frac{1}{2}$

$$\begin{array}{r} \text{L } 57-17-8 \\ \text{S } 3\frac{1}{4} \quad 6-0 \\ \hline 12:3-4-5\frac{1}{2}::3 \\ \hline \text{S } 9\frac{1}{4} \quad 12 \\ \text{P } 5\frac{1}{4} \quad 4 \\ \hline \text{f } 2\frac{1}{2} \end{array}$$

3 How much is the interest of
150l 19s for 3 years and 4 months
at 6 per cent per annum. Ans 30l

$$\begin{array}{r} 3s \quad 9d \quad \text{L } 150-19 \\ \hline \text{L } 9\frac{1}{4} \quad 20 \\ \text{S } 11\frac{1}{4} \quad 12 \\ \hline 12:9-1-1\frac{1}{2}::40 \\ \hline \text{P } 1\frac{1}{4} \quad 6 \\ \hline \text{f } 2\frac{1}{2} \end{array}$$

4 What is the interest of 126l 12s
for 16 weeks at 1 $\frac{1}{2}$ per cent per
annum Ans 15s 0d $\frac{1}{2}$

$$\begin{array}{r} 12 \overline{) 126-12} \\ \underline{506-8} \\ 63-6 \\ \hline \text{L } 5\frac{1}{4} \quad 20 \\ \text{S } 13\frac{1}{4} \quad 12 \\ \hline 52:5-13-11\frac{1}{4}::16 \\ \hline \text{P } 11\frac{1}{4} \quad 28 \\ \hline \text{f } 1\frac{1}{4} \end{array}$$

5 How much is the amount of 243
l 14s for 146 days at 5 $\frac{3}{4}$ per cent
Ans 249l 9s 2d.

$\frac{3}{4} \frac{1}{2} \frac{1}{2}$
 $\frac{4}{4} \frac{1}{2}$
 $\frac{1}{2}$

$\frac{1}{2}$ 243-17
 $\frac{1}{2}$ 12 19-5
 $\frac{1}{2}$ 1 21 18-6
 $\frac{1}{2}$ 60 18-3
 $\frac{1}{2}$ 1402-1-9
 $\frac{1}{2}$ 20
 $\frac{1}{2}$ 41
 $\frac{1}{2}$ 12 365:14-0-5::146
 $\frac{1}{2}$ 5/01

$\frac{1}{2}$ 212-13-2 3/4
 $\frac{1}{2}$ 242 12 11 3/4
 $\frac{1}{2}$ 674 13 8 3/4
 $\frac{1}{2}$ 917 6 1 1/2 Ans

6 What is the interest of 71 l 3 s
 11 d for 1 year 5 months and 25
 days at 6 per cent per annum.
 Ans 6 s 10 d 4/11

$\frac{1}{2}$ 71-3-11 1/2
 $\frac{1}{2}$ 20
 $\frac{1}{2}$ 5/43
 $\frac{1}{2}$ 12
 $\frac{1}{2}$ 5/25
 $\frac{1}{2}$ 1/00

10 What is the interest of
 517 dollars at 6 per cent per
 annum for 30 days
 Ans 2,58

$\frac{1}{2}$ 517
 $\frac{1}{2}$ 30
 $\frac{1}{2}$ 60) 15510
 $\frac{1}{2}$ 2,58 Ans

11 What is the interest of
 325 dollars at 6 per cent per
 annum for 64 days
 Ans 3,46

$\frac{1}{2}$ 325
 $\frac{1}{2}$ 64
 $\frac{1}{2}$ 1300
 $\frac{1}{2}$ 1950
 $\frac{1}{2}$ 60) 20800
 $\frac{1}{2}$ 3,46 Ans

7 What is the amount of a bond
 for 116 l 17 s 2 d. for 6 years 7 months
 and 19 days at 7 per cent per annum
 Ans 171 l 2 s 7 d.

$\frac{1}{2}$ 116-17-2
 $\frac{1}{2}$ 20
 $\frac{1}{2}$ 3/68
 $\frac{1}{2}$ 12:8-3-7::6-7-19
 $\frac{1}{2}$ 7/24
 $\frac{1}{2}$ 88

12 At 6 per cent what
 will the interest be of 100 l
 from the 6th of the 7th
 month (July) to the 1st
 month (January) Ans 3 l 15 s 9 1/2 d

$\frac{1}{2}$ 100
 $\frac{1}{2}$ 31
 $\frac{1}{2}$ 25
 $\frac{1}{2}$ 12:6::5-34

9 What sum will 694 l 13 s 8 3/4
 amount to in 5 years 11 months
 and 28 days at 6 per cent per
 annum. Ans 917 l 6 s 1 1/2 d

$\frac{1}{2}$ 694-13-8 3/4
 $\frac{1}{2}$ 20
 $\frac{1}{2}$ 3/68
 $\frac{1}{2}$ 12:8-3-7::6-7-19
 $\frac{1}{2}$ 7/24
 $\frac{1}{2}$ 88

13 Tell the interest of 2410 l
 for 1 year and 135 days at 7
 per cent per annum Ans 23 l 0 s 3 d

$\frac{1}{2}$ 2410
 $\frac{1}{2}$ 14820
 $\frac{1}{2}$ 51600
 $\frac{1}{2}$ 365:16-16::1-135
 $\frac{1}{2}$ 20
 $\frac{1}{2}$ 365
 $\frac{1}{2}$ 336500
 $\frac{1}{2}$ 500
 $\frac{1}{2}$ 365/168000

14 What is the interest of
371^l for 1 year and 213 days
at 6 per cent per annum
Ans 35^l 53^s 0^d

$$\begin{array}{r} 371 \\ \text{L} 22 \overline{) 260} \\ \text{S} 5 \overline{) 12} \\ \text{D} 2 \overline{) 4} \end{array}$$

$$\text{D} \text{P} 176 \text{D}$$

$$365 : 22-5-244 :: 365 \\ 213 \\ 578$$

15 What is the interest of a
bond for 325^l 15^s 6^d for 1 year
and 73 days at 7 per cent per
annum Ans 21^l 7^s 3^d 1/2

$$\begin{array}{r} 325-15-6 \\ \text{L} 22 \overline{) 80-8-6} \\ \text{S} 16 \overline{) 08} \\ \text{D} 11 \overline{) 02} \end{array}$$

$$\begin{array}{r} 365 : 22-16-1 :: 365 \\ 73 \\ 438 \end{array}$$

16 Required the interest of a
bond for 148^l 12^s 6^d 1/2 for 11
months at 6 per cent per annu
m Ans 8^l 3^s 3^d 3/4

$$\begin{array}{r} 148-12-6 \frac{1}{2} \\ \text{L} 8 \overline{) 178-11 \frac{3}{4}} \\ \text{S} 3 \overline{) 48} \\ \text{D} 5 \overline{) 87} \\ \text{P} 3 \overline{) 51} \end{array}$$

17 What sum will a bond of 333^l
13^s 3^d 1/4 amount to in 17 mon
ths at 6 per cent per annum
Ans 362^l 0^s 6^d 1/2

$$\begin{array}{r} 333-13-3 \frac{1}{4} \\ \text{L} 22 \overline{) 2669-6-6} \\ \text{S} 16 \overline{) 16} \\ \text{D} 17 \overline{) 14} \end{array}$$

$$\begin{array}{r} 333-13-3 \frac{1}{4} \\ \text{L} 28 \overline{) 362-0-6 \frac{1}{2}} \\ \text{S} 12 \overline{) 23} \\ \text{D} 2 \overline{) 77} \\ \text{P} 3 \overline{) 11} \end{array}$$

18 Father left a legacy to his dau
ghter of 651^l 11^s to be at interest
until she attained the age of eighteen
at his decease she was 15 years and
219 days old; what sum must she
call on her executor for interest
computed at 7 per cent per annum
Ans 761^l 0^s 2^d 1/2

$$\begin{array}{r} 651-11 \\ \text{L} 45 \overline{) 60-17} \\ \text{S} 12 \overline{) 17} \\ \text{D} 2 \overline{) 04} \\ \text{D} 2 \overline{) 04} \end{array}$$

19 What interest is due on a legacy
of 517^l 12^s 8^d 1/2 for 5 years 11 months
and 25 days at 6 per cent per annum
Ans 185^l 17^s 9^d 0

$$\begin{array}{r} 517-12-8 \frac{1}{2} \\ \text{L} 185 \overline{) 178-9} \\ \text{S} 18 \overline{) 17} \\ \text{D} 11 \overline{) 6} \end{array}$$

20 What is the interest of one farthing
for 579 1/4 years at 7 per cent per
annum Ans 8^s 5^d 1/4

Case 4

2 What is the insurance of
an East India ship and cargo
valued at 7406 £ 17 5 6d at 15 3/4
per cent Ans 1166 £ 11 5 10 3/4

$$\begin{array}{r} 3\frac{1}{4} \text{ hr} \\ 2 \overline{) 71106} \end{array}$$

$$\begin{array}{r} 1\frac{1}{4} \text{ hr} \\ 2 \overline{) 22220} \end{array}$$

$$\begin{array}{r} 1\frac{1}{2} \text{ hr} \\ 2 \overline{) 11103} \end{array}$$

$$\begin{array}{r} 1\frac{1}{2} \text{ hr} \\ 2 \overline{) 3703} \end{array}$$

$$\begin{array}{r} 1\frac{1}{2} \text{ hr} \\ 2 \overline{) 1851} \end{array}$$

$$\begin{array}{r} 1\frac{1}{2} \text{ hr} \\ 2 \overline{) 116658} \end{array}$$

$$\begin{array}{r} 1\frac{1}{2} \text{ hr} \\ 2 \overline{) 51165} \end{array}$$

$$\begin{array}{r} 1\frac{1}{2} \text{ hr} \\ 2 \overline{) 787} \end{array}$$

$$\begin{array}{r} 1\frac{1}{2} \text{ hr} \\ 2 \overline{) 350} \end{array}$$

3 Suppose $1\frac{3}{4}$ per cent be allowed for commission: what must be demanded on 7041554d.
Ans 12658d.

[illegible]

11 What is the brokerage of 700 l
145 6d. at 1/3 per cent Ans
1685 0d 1/4 L S D

$0d\frac{1}{4}$ L S D
 L 700-14-6
 $\frac{20}{14}$
 12
 D 1174
 82/96 L S D
 11 $\frac{1}{5}$ 7-0-1 1/2
 1-8-0 1/4 Ans

3. testator left his son besides providing for his education &c. 2000 dols to receive the amount thereof at 5 per cent when he should arrive at the age of 21 years which his guardian then found to be 2925 dols how old was the boy

at his fathers decease.
Ans 11 years 9 months.

$$\begin{array}{r}
 \begin{array}{r}
 \text{D} \\
 2000 \\
 10000 \\
 \hline
 2925 \\
 2000 \text{ y M} \\
 100 \overline{) 925} \begin{array}{l} 9 \\ 3 \end{array} \\
 \underline{900} \\
 25 \\
 12 \\
 300 \begin{array}{l} 3 \\ 0 \\ 0 \end{array} \\
 \hline
 3000
 \end{array} \\
 \begin{array}{r}
 \text{y M} \\
 21-0 \\
 9-3 \\
 \hline
 11-9 \text{ Ans}
 \end{array}
 \end{array}$$

1 What is the interest of
2466 16 56 for 10 months at
4 per cent per annum

$$\begin{array}{r}
 \begin{array}{r}
 \text{L S D} \\
 2466-16-6 \\
 9867 \begin{array}{l} 6 \\ 0 \\ 10 \end{array} \\
 \hline
 98673 \begin{array}{l} 0 \\ 0 \end{array}
 \end{array}
 \quad
 \begin{array}{r}
 \text{L S D} \\
 900=75-0-0 \\
 80=6 \begin{array}{l} 13 \\ 4 \end{array} \\
 6=10 \begin{array}{l} 0 \\ 0 \end{array} \\
 \hline
 1 \begin{array}{l} 2 \\ 1/2 \end{array}
 \end{array}
 \end{array}$$

82-4-6 1/2 ans

Rule

2 What is the interest of 2467 10 5 for 12 weeks at 5 per cent per annum.

$$\begin{array}{r}
 \begin{array}{r}
 \text{L S} \\
 2467-10 \\
 12337 \begin{array}{l} 10 \\ 12 \end{array} \\
 \hline
 148050
 \end{array}
 \quad
 \begin{array}{r}
 \text{L S D} \\
 1000=19-11-7 1/4 \\
 400=7 \begin{array}{l} 13 \\ 10 \end{array} \\
 1 \begin{array}{l} 10 \\ 2 1/2 \end{array}
 \end{array}
 \end{array}$$

ans 28-9-5

3 What is the interest of 2467 10 5 for 50 days at 6 per cent per annum

$$\begin{array}{r}
 \begin{array}{r}
 \text{L S} \\
 2467-10 \\
 14805 \begin{array}{l} 0 \\ 10 \end{array} \\
 \hline
 148850 \begin{array}{l} 0 \\ 5 \end{array} \\
 744250
 \end{array}
 \quad
 \begin{array}{r}
 \text{L S D} \\
 7000=19-3-6 3/4 \\
 400=1-1-11 \\
 \hline
 20-5-7 1/4 \text{ ans}
 \end{array}
 \end{array}$$

2 What will 400 l amount to in 4 years at 6 per cent per annum. Ans 1780 dols for six years at 5 per cent per annum Ans 4

2 What will 400 l amount to in 4 years at 6 per cent per annum Ans 504 l 19 3 1/4

$$\begin{array}{r}
 \begin{array}{r}
 \text{L S} \\
 1505 \begin{array}{l} 20 \\ 1 \end{array} \\
 205 \begin{array}{l} 20 \\ 1 \end{array} \\
 305 \begin{array}{l} 20 \\ 1 \end{array} \\
 405 \begin{array}{l} 20 \\ 1 \end{array} \\
 505 \begin{array}{l} 20 \\ 1 \end{array}
 \end{array}
 \quad
 \begin{array}{r}
 \text{L S} \\
 400-0-0 \\
 20-0-0 \\
 4-0-0 \\
 424-0-0 \\
 21-10-0 \\
 4-10-0 \\
 449-8-9 1/2 \\
 22-9-5 1/4 \\
 4-10-0 \\
 476-8-1 1/2 \\
 23-16-4 3/4 \\
 4-15-3 1/4 \\
 \hline
 504-19-9 1/4 \text{ Ans}
 \end{array}
 \end{array}$$

3 how much is the compound interest of 1280 dols for six years at 5 per cent per annum *Ans* 1133.322 mills.

5	$\frac{1}{20}$	1280	
		64	
5	$\frac{1}{20}$	1344	
		67.2	
5	$\frac{1}{20}$	1411.2	
		70.56	
5	$\frac{1}{20}$	1481.76	
		74.088	
5	$\frac{1}{20}$	1555.848	
		77.7924	
5	$\frac{1}{20}$	1633.6404	
		81.682	
		1715.3224	
		1280	
		1133.322	<i>Ans</i>

Rebate on
discount

2 What is the present worth of 130 dols 67 cts. for 19 months discount at 5 per cent *Ans* 399.07 cts.

$$M \quad P \quad M$$

$$12 : 5 :: 19$$

$$\frac{195}{7.916}$$

$$\frac{100}{107.916}$$

$$D \quad M \quad P \quad D \quad L \quad M$$

$$107.916 : 100 :: 130.67.0$$

4 What will 500 l amount to in 11 years at 4 1/4 per cent per annum *Ans* 590 l 11 s 5 1/2 d

4 1/4	11	500		
		21	5	0
4 1/4	16	521	5	0
		20	17	
4 1/4	25	1	6	0 3/4
4 1/4	16	543	8	0 3/4
		21	14	8 1/2
4 1/4	25	1	7	2
4 1/4	16	566	9	11 1/4
		22	13	2 1/4
4 1/4	25	1	8	3 3/4
4 1/4	16	590	11	5 1/4 <i>Ans</i>

3 To l goods for 795 l 11 s 2 c. to be paid 11 months hence; what is the present worth at 3 1/2 per cent *Ans* 786 l 7 s 8 d.

$$M \quad L \quad M$$

$$12 : 3 1/2 :: 11$$

$$\frac{20}{70}$$

$$12) 280$$

$$20) 230$$

$$100$$

$$101.34 : 100 :: 795.11.2$$

5 What is the compound interest of 100 l 10 s at 3 1/2 per cent per annum for 3 years.

Ans 113 l 10 s 9 d 4 1/4

3 1/2	3	100	10	0
		8	00	2 1/4
3 1/2	2	108	00	1
		4	00	0 1/2
3 1/2	2	112	00	0 1/2
		4	10	3 3/4
3 1/2	2	116	10	3 3/4
		4	5	9 1/2
3 1/2	2	120	20	10 3/4
		4	2	10 3/4
3 1/2	2	124	20	5 1/4
		4	11	7 1/4
3 1/2	2	128	30	9 1/2
		4	5	9 1/2
3 1/2	2	132	80	10 3/4
		4	2	10 3/4
3 1/2	2	136	00	8 3/4
		4	0	10
		136	10	8 3/4 <i>Ans</i>

4 What is the rebate of 112 l 12 s. for 20 months at 7 per cent *Ans* 11 l 15 s 3 d 1/2

$$M \quad L \quad M$$

$$12 : 7 :: 20$$

$$12) 140$$

$$11.13.4$$

$$100$$

$$111.13.4 : 100 :: 112.12$$

5 Tole goods for 832 dols one half to be paid at 3 months and the other half at 6 months: wh at must be discounted for pres ent payment at 5 per cent Ans

15,28,5 mills.

m D m

12:5::3

12)15

1.25 D

100

101,25:100::

2832

416,000

10500

11000

10125

87500

81000

65000

60750

112500

110500

102,50:100::

116,000

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

102,50

3 It owes H 1000 dol of which 200 dol are to be paid present 1000 dol at 5 months and the rest at 10 months but they agree to make one payment of the whole and wish to know the time Ans 6 months

$$\begin{array}{r} 200 \times = \\ 1000 \times 5 = 2000 \\ 1000 \times 10 = 1000 \\ \hline 1000 \quad 2600 \\ \hline 6 \text{ months and} \end{array}$$

4 C owes A a sum of money which is to be discharged viz $\frac{1}{2}$ at 2 months $\frac{1}{4}$ at 4 months $\frac{1}{8}$ at 6 months and $\frac{1}{8}$ at 8 months: but they agreeing to make one payment of the whole the equated time is required Ans 5 months

$$\begin{array}{r} 50 \times 2 = 100 \\ 50 \times 4 = 200 \\ 50 \times 8 = 400 \\ 50 \times 6 = 300 \\ \hline 200 \quad 2100 \\ \hline 5 \text{ Ans} \end{array}$$

5 C is indebted to H 240 dol which by agreement is to be paid 5 months hence but C is willing to pay him 100 dol present provided he will give him longer time to pay the remainder which is agreed on: the time of payment is the before required Ans 6 months

$$\begin{array}{r} 240 \times 5 = 1200 \\ 100 \\ \hline 200 \quad 21200 \\ \hline 6 \text{ months and} \end{array}$$

6 P owes L 1120 l which will be due 6 months hence but P is willing to pay him 60 l present provided he can have the remainder borne a longer time to which I agree: the time of payment is required Ans 7 months.

$$\begin{array}{r} 1120 \times 6 = 2520 \\ 60 \\ \hline 360 \quad 2520 \quad 7 \text{ months} \end{array}$$

Barter

2 What quantity of tea at 10s per lb. must be given for 1 cwt of chocolate at 4s per lb. Ans

$$\begin{array}{r} 11 \text{ lb } 12 \text{ oz } + \text{ lb} \\ \text{lb } 3 \text{ } \\ 1 : 4 :: 192 \\ 3 \text{ lb } \\ 10 : 1 :: 1118 \end{array}$$

3 How much rice at 28s per cwt. must be bartered for $3\frac{1}{2}$ of raisins at 50 per lb. Ans 5 c. 39 lb 7

$$\begin{array}{r} \text{lb } 9 \text{ cwt } 9 \\ 1 : 5 :: 3 - 2 \\ 14 \\ 28 \\ 112 \\ 28 \\ 392 \\ 5 \text{ cwt } \\ 28 : 1 :: 1960 \end{array}$$

4 A has linen cloth worth 20 cts an ell ready money but in barter he will have 25 cts B has broad cloth worth 2 dols per yard ready money: at what price ought the broad cloth to be rated in barter Ans 2,50 cts

$$\begin{array}{r} 6 \quad 6 \quad 6 \\ 20:25::200 \\ \underline{200} \\ 205000 \\ 250 \text{ Ans} \end{array}$$

5 Suppose C has tea at 88¢ per lb. ready money but in barter he will have 108 per lb. D has tobacco worth 180 per lb. ready money how must he rate his tobacco per lb. to equal the tea in value *Ans* 159d.

$$\begin{array}{r} S \quad D \quad S \quad D \\ 8-6:10::180 \quad S \quad D \\ \underline{12} \\ 102 \quad \underline{1180} \quad 159 \text{ Ans} \\ \quad \quad \underline{102} \\ \quad \quad 78 \\ \quad \quad \underline{12} \\ \quad \quad 936 \\ \quad \quad \underline{918} \end{array}$$

6 A has nutmegs worth 1 dol per po and ready money but in barter will have 106 cts per pound D has tobacco worth 10 cts. per lb. ready money: how must D rate his tobacco that his profits may be equivalent with *Ans* 106 mills.

$$\begin{array}{r} C \quad C \quad C \\ 100:106::10 \\ \underline{10} \\ 1060 \quad 106 \text{ mills} \\ \underline{100} \\ 600 \\ \underline{600} \end{array}$$

7 A had 111 cwt. of iron at 30s per cwt for which B gave him 20 in money and the rest in pork at 50 per lb. how much pork must be given besides the 20l? *Ans* 1792 lb.

$$\begin{array}{r} \text{cwt} \\ 111 \\ 30 \\ \underline{20} \\ 20120 \\ \underline{610} \\ D \text{ lb } 20 \\ 5:1::41 \quad 10 \\ \underline{20} \\ 830 \\ \underline{579960} \\ 1792 \text{ lb } \text{Ans} \end{array}$$

8 A has 320 dozens of candles at 120 cts per dozen for which B agrees to pay him 160 dols in cash and the rest in cotton at 20 cts per pound how much cotton must B give A *Ans* 1120 lb.

$$\begin{array}{r} 320 \\ \underline{120} \\ 6400 \\ \underline{320} \\ C \text{ lb } 38400 \\ \underline{160} \\ 20:1::22400 \\ \underline{122400} \\ 1120 \text{ lb } \text{Ans} \end{array}$$

9 H has 75 sheep at 14s 6d each for which I is to give him 14l 12s and the rest in Indian corn at 3s 6d per bushel: how much corn must I give H? *Ans* 210 bu 18 qt.

$$\begin{array}{r} S \quad D \\ 14-6 \times 3 \\ \underline{2 \times 9} = 75 \\ 5160 \\ \underline{7} \\ 5240 \\ \underline{236} \\ 5476 \\ \underline{1712} \\ 36156 \end{array}$$

$$\begin{array}{r} S \quad D \quad B \quad S \quad D \\ 3-6:1::3615-6 \end{array}$$

10 A and B bartered; A had 5c. of sugar at 6d per pound which he gave to B for a quantity of cinnamon at 10s 8d. per pound how much cinnamon did B give A *Ans* 26 lb 10 oz.

$$\begin{array}{r} \text{cwt} \\ 5 \\ \underline{4} \\ 20 \\ \underline{20} \\ 160 \\ S \quad D \text{ lb } 560 \\ \underline{10-8:1}::3360 \end{array}$$

11 B delivers 3 hogsheads of brandy at 63 8d per gallon to C, for 126 yards of cloth: what was the cloth per yard

Ans 10 8 7/8 D 36

$$\begin{array}{r} 1 : 6-8 :: 3 \\ \hline 63 \\ 189 \\ 80 \end{array}$$

$$\begin{array}{r} \text{yds } 12 \overline{) 15120} \\ 126 \overline{) 1260} \quad (10 \text{ s. Ans} \\ \hline 1260 \end{array}$$

12 C has candles at 12 s. per dozen ready money but in barter he will have 13 s per dozen. P has cotton at 180 per pound ready money: what price must the cotton be at in barter and how much must be bartered for 100 dozen of candles? Ans the cotton at 190 1/2 per pound and 800 lb must be given for 100 dozen candles.

$$\begin{array}{r} \text{S S D} \\ 12 : 13 :: 18 \\ \hline 12 \\ 144 \end{array}$$

$$\begin{array}{r} \text{S D} \\ 12 : 13 :: 18 \\ \hline 12 \\ 144 \end{array}$$

$$\begin{array}{r} 1080 \\ \hline 1008 \end{array}$$

$$\begin{array}{r} 72 \\ \hline 14 \end{array}$$

$$\begin{array}{r} \text{S D} \\ 12 : 13 :: 18 \\ \hline 12 \\ 144 \end{array}$$

$$\begin{array}{r} 1300 \\ \hline 15600 \end{array}$$

$$\begin{array}{r} 162400 \\ \hline 624 \end{array} \quad \text{Ans}$$

13 A has linen at 100 the ell ready money but in barter 15 B has 3610 lb of sugar

at 7d 1/2 per lb. ready money and will have of A 35 l in cash and the rest in linen: at what rate is the sugar in barter and how much linen must A give B Ans the sugar 9d and 186 1/2 ells.

$$\begin{array}{r} \text{D S D} \\ 10 : 1 :: 7 1/2 \\ \hline 40 \quad 12 \quad 30 \end{array}$$

$$\begin{array}{r} 40 \overline{) 360} \\ \hline 9 \text{ ans} \end{array}$$

lb

$$3610$$

$$7 1/2$$

$$25270$$

$$1805$$

$$12 \overline{) 27045}$$

$$2256 \text{ } 3$$

$$112 \text{ } 16 \text{ } 3$$

$$\begin{array}{r} \text{P ell } 35 \\ 10 : 1 :: 7 1/2 \text{ } 16 \text{ } 3 \end{array}$$

$$20$$

$$1556$$

$$12$$

$$10 \overline{) 18615}$$

$$1867 1/2 \text{ Ans}$$

14 Two merchants barter. A receives 20 cwt. of cheese at 21 s 6d. per cwt B 8 pieces of linen at 3 l 11 s per piece which of them must receive money and how much Ans A 8 l 2 s

$$\begin{array}{r} \text{S D} \\ 21 \text{ } 6 \end{array}$$

$$11 \times 520$$

$$4605$$

$$21 \text{ } 10 \text{ } 0$$

$$\text{L S}$$

$$3 \text{ } 11$$

$$8$$

$$29 \text{ } 12$$

$$21 \text{ } 10$$

$$8 \text{ } 2$$

$$\text{Ans}$$

15 If 24 yards of cloth be given for 5 cwt. of tobacco at 1 l 18 s per cwt what is the cloth rated at per yard Ans 8 s 3d 3/4

$$\begin{array}{r} 21 \\ 38 \\ \hline 76 \\ 4 \overline{) 798} \\ \underline{199} \quad 6 \quad (12) \\ 3 \quad 12 \\ \hline 24 \overline{) 2394} \left(\frac{99}{8 = 3\frac{3}{4}} \right. \text{Ans} \\ \underline{216} \\ 234 \\ \underline{216} \\ 184 \\ \underline{172} \quad \left(\frac{3}{4} \right) \end{array}$$

16 A barter 110 yards of cloth
at 75 10 per yard with 75 for
28 lb of tea at 113 60 per pou
nd: which must pay bal
ance and how much? Ans A

$$\begin{array}{r} 1614950 \\ 5 \overline{) 11618} \\ 7 \sim 14 \\ 5 \times 8 = 40 \\ 11618 \\ 141311 \end{array}$$

17 I has $7\frac{1}{2}$ cwt. of sugar at 8d
per pound for which I gave him
 $12\frac{1}{2}$ cwt. of cheese. what was the
~~the~~ cheese rate at per pound
ans $11\frac{3}{4}$. lb I cwt 92

ans 1403 1/4.

cut gp
12 ~ 2
4
50
28
100
100
1400

lb Dwt gr
1 : 8 : 7 : 2
4
30
28
240
60
840 ans
1400) 6720 (4 3/4
5600
1120
4
14480 (3

18 What quantity of sugar
at 80 per lb must be given
in barter for 20 cwt. of tobacco
at 3 l. per hundred
weight Ans 16 cwt 8 lb.

cwt L cwt
 1 : 3 :: 20
 60 lb 3
 8 : 1 :: 60

19 B has coffee which he
barter's with the L a 10d per
lb more than it cost him
against tea which ^stands L in
10s the lb. but puts it at 12s
6d. query the prime cost of
the coffee. Ans 3s 4d.

$$\begin{array}{r} 12 \cdot 6 \\ \underline{10} \\ 2 \cdot 6 : 10 :: 10 \\ \underline{12} \\ 30 \end{array}$$

$$\begin{array}{r} 1100 \\ \underline{3 \cdot 11} \end{array} \text{ Ans}$$

20 A and B barter: A has $12\frac{1}{2}$ cwt
of hops at 2L 16S per cwt but in
barter insists on 3L B has wine
worth 5S a gallon which he rais-
es in proportion to A's demand
on the balance A received but a
hhd of wine: what had he in
ready money. ans 20L 12S 6D.

$20 \times 12 = 240$
 $20 \times 16 = 320$
 $20 \times 20 = 400$
 $20 \times 24 = 480$
 $20 \times 28 = 560$
 $20 \times 32 = 640$
 $20 \times 36 = 720$
 $20 \times 40 = 800$
 $20 \times 44 = 880$
 $20 \times 48 = 960$
 $20 \times 52 = 1040$
 $20 \times 56 = 1120$
 $20 \times 60 = 1200$
 $20 \times 64 = 1280$
 $20 \times 68 = 1360$
 $20 \times 72 = 1440$
 $20 \times 76 = 1520$
 $20 \times 80 = 1600$
 $20 \times 84 = 1680$
 $20 \times 88 = 1760$
 $20 \times 92 = 1840$
 $20 \times 96 = 1920$
 $20 \times 100 = 2000$

Loss and Gain

2 Bought knives for 20 cts each and sold them at 17 cts each: how much is lost by the sale of 120 dozen? Ans

113,20 cts. $\begin{matrix} \text{wife} & 6 \\ 1: & \frac{20}{3} :: 120 \\ & 12 \\ & 1440 \\ & 3 \\ \text{ans} & 113,20 \end{matrix}$

3 Hats bought at 48 a piece and sold at 48 7/8. what is the gain per cent? Ans 18 1/5 %

$\begin{matrix} \$ & 9 \\ 11 & 9 \\ \$ & 11 \\ 4 & 9 :: 100 \\ & 20 \\ & 2000 \\ 11 & 8000 \\ 12 & 500 \\ 20 & 375 \\ 18 & 15 \text{ ans} \end{matrix}$

hhd take
 $\frac{17}{17} \quad \frac{63}{63}$

$\begin{matrix} 20 & 500 \\ 17 & 8000 \\ 17 & 8000 \\ 17 & 8000 \\ 17 & 8000 \\ 17 & 8000 \\ 17 & 8000 \\ 17 & 8000 \\ 17 & 8000 \\ 17 & 8000 \end{matrix}$

5 A draper bought 100 yards of cloth for 119 dols how must he sell it per yard to gain 51 dols in the whole? Ans 2 dols per yard.

$\begin{matrix} 100 & 5100 & 51 \text{ cts} \\ 119 & 500 & 100 \\ 119 & 500 & 100 \\ 119 & 500 & 100 \\ 119 & 500 & 100 \end{matrix}$

4 Bought 7 tuns of wine at 17 l per hhd and sold it at 18. per pint what is the whole gain and the gain per cent?

Ans whole gain 229 l 12 s per cent 118 l 11 s 8 d 4 m %

$\begin{matrix} 7 & 1 \\ 4 & 1 \\ 28 & 28 \\ 17 & 63 \\ 196 & 81 \\ 28 & 168 \\ 476 & 1464 \end{matrix}$

$\begin{matrix} 20 & 14112 \\ 705 & 12 \\ 476 & \\ 229 & 12 \text{ Ans} \end{matrix}$

6 Bought 60 reams of paper at 2 dols per ream what is lost in the whole quantity at 11 per cent. Ans 4,80 cts

$\begin{matrix} 60 \\ 2 \\ 120 \\ 120 \\ 4,80 \text{ Ans} \end{matrix}$

7 Sold 500 penknives at 150 a piece and 9 per cent lost what is lost in the whole number Ans 3 l 15 s 9 d 3/4

$$\begin{array}{r} 500 \\ 15 \\ 12 \overline{) 7500} \\ 2 \overline{) 625} \\ 11 : 9 :: 31 \cdot 5 \\ 20 \\ 1820 \end{array}$$

$$\begin{array}{r} 5625 \\ 5460 \\ 1650 \\ 3300 \\ 1820 \\ 1480 \\ 17760 \\ 16380 \\ 1380 \\ 5520 \end{array}$$

8 Paid 69l. for 1 ton of steel what is the profit or loss on the sale of 14 tons retailed at 6d. per pound Ans 182l. loss.

$$\begin{array}{r} 69 \\ 14 \\ 276 \\ 69 \\ 966 \\ 784 \\ 182 \end{array}$$

$$\begin{array}{r} 14 \\ 20 \\ 280 \\ 1120 \\ 28 \\ 8960 \\ 2240 \\ 1188160 \\ 15680 \\ 784 \end{array}$$

9 If a yard of cloth be bought for 13s 4d and sold for 16s. what is the gain per cent? Ans 20l

$$\begin{array}{r} 13 \cdot 4 : 16 :: 100 \\ 12 \\ 160 \end{array}$$

$$\begin{array}{r} 16 \\ 12 \\ 32 \end{array}$$

$$\begin{array}{r} 2000 \\ 24000 \\ 48000 \\ 72000 \\ 768000 \\ 640 \\ 1280 \\ 128000 \end{array}$$

10 If 1c. of tobacco be bought for 11s 13d. and sold at 11d per pound what is the gain or loss per cent ans 10l gain.

$$\begin{array}{r} 112 \\ 11 \\ 12 \overline{) 1232} \\ 2 \overline{) 102 \cdot 8} \\ 5 \cdot 2 \cdot 8 \\ 11 \cdot 13 \cdot 4 \\ 4 \cdot 13 \cdot 4 : 9 \cdot 11 :: 100 \\ 20 \\ 2000 \\ 112 \\ 24000 \\ 48000 \\ 24000 \\ 24000 \\ 268800 \\ 2240 \\ 1180 \\ 118000 \end{array}$$

11 A draper bought 100 yards of cloth for 56l. how must he sell it per yard to gain 15l. per cent Ans 12s 10d 1/2

$$\begin{array}{r} 56 \\ 10 \\ 5 \overline{) 10} \\ 2 \\ 100 : 64 \cdot 8 :: 1 \\ 20 \\ 81288 \\ 12 \\ 1056 \\ 224 \end{array}$$

12 Sold 12 yards of cloth for 5l 11s by which was gained percent what was the prime cost of a yard Ans 8s 9d 1/2 +

$$\begin{array}{r} 5 \cdot 11 \\ 4 \overline{) 25} \\ 4 \overline{) 25} \\ 5 \cdot 11 \\ 5 \cdot 11 \\ 12 \overline{) 108} \\ 9 \\ 11088 \\ 11 \end{array}$$

13 Having bought a parcel of goods for 18 l and sold the same immediately for 25 l with 11 months credit: what is gained per cent per annum?
Ans 116 l 13 s 4 d.

$$\begin{array}{r} \text{£} 25 \\ \text{£} 18 : 21 :: 100 \\ \hline 12100 \end{array} \quad \begin{array}{r} \text{£} 116 \\ \text{£} 13 \\ \text{£} 4 \end{array}$$

per cent. what will be the gain per cent when it is sold for 8 s 6 d. per year? Ans 33 l 11 s 5 d.

$$\begin{array}{r} \text{£} 100 \\ \text{£} 110 : 100 :: 7 \\ \hline 110 \overline{) 700} \end{array} \quad \begin{array}{r} \text{£} 6 \\ \text{£} 11 \end{array} \quad \begin{array}{r} \text{£} 110 \\ \text{£} 660 \end{array} \quad \begin{array}{r} \text{£} 110 \\ \text{£} 660 \end{array} \quad \begin{array}{r} \text{£} 110 \\ \text{£} 660 \end{array} \quad \begin{array}{r} \text{£} 110 \\ \text{£} 660 \end{array} \quad \begin{array}{r} \text{£} 110 \\ \text{£} 660 \end{array} \quad \begin{array}{r} \text{£} 110 \\ \text{£} 660 \end{array} \quad \begin{array}{r} \text{£} 110 \\ \text{£} 660 \end{array} \quad \begin{array}{r} \text{£} 110 \\ \text{£} 660 \end{array}$$

14 Bought 300 lbs. of coffee at 4 s 2 d. per lb. ready money and sold it at 5 s. per pound payable in 8 months. how much was gained on the whole all owing discount at 6 percent and how much percent per annum?
Ans 9 l 12 s 3 d 1/2 whole gain in 8 months

$$\begin{array}{r} \text{£} 1253 \text{ d } 1/2 \\ \text{£} 300 \text{ at } 5 \end{array} \quad \begin{array}{r} \text{£} 1500 \\ \text{£} 1253 \text{ d } 1/2 \\ \hline \text{£} 246 \text{ s } 10 \end{array}$$

$$12 : 6 :: 8$$

$$12 \overline{) 148} \quad \begin{array}{r} \text{£} 100 \\ \text{£} 104 : 100 :: 75 \end{array}$$

$$\begin{array}{r} \text{£} 72 \\ \text{£} 2 \\ \text{£} 3 \end{array}$$

$$\begin{array}{r} \text{£} 62 \\ \text{£} 10 \end{array}$$

$$\begin{array}{r} \text{£} 1200 \\ \text{£} 1200 \end{array}$$

$$\begin{array}{r} \text{£} 14400 \\ \text{£} 500 \end{array}$$

$$\begin{array}{r} \text{£} 15000 \\ \text{£} 14400 \\ \hline \text{£} 600 \end{array}$$

$$\begin{array}{r} \text{£} 500 \\ \text{£} 15000 \end{array}$$

16 Bought a chest of tea weighing 1190 lb. for 326 dols and sold it for 370.10 cts. what was the profit on each lb. Ans 9 cts

$$\begin{array}{r} \text{£} 370.10 \\ \text{£} 326 \\ \hline \text{£} 44.10 \end{array} \quad \begin{array}{r} \text{£} 1190 \\ \text{£} 44.10 \end{array}$$

17 Bought 12 pieces of white cloth for 6 l 10 s. per piece paid 20 s 10 d a piece for dying: for how much must i sell them each to gain 20 percent? Ans 9 l 1 s.

$$\begin{array}{r} \text{£} 6 \\ \text{£} 10 \\ \text{£} 20 \end{array} \quad \begin{array}{r} \text{£} 10 \\ \text{£} 10 \\ \text{£} 10 \end{array} \quad \begin{array}{r} \text{£} 10 \\ \text{£} 10 \\ \text{£} 10 \end{array} \quad \begin{array}{r} \text{£} 10 \\ \text{£} 10 \\ \text{£} 10 \end{array}$$

18 If 28 pieces of stuff be purchased at 4 l. per piece and 10 of them sold at 6 l and 8 at 5 l per piece: at what rate must the rest be disposed of to gain 10 percent. by the whole? Ans 2 l 6 s 4 d 3/4

$$\begin{array}{r} \text{£} 2 \\ \text{£} 6 \\ \text{£} 4 \\ \text{£} 3 \end{array}$$

pieces	pieces	pieces
28	10	85
$\frac{11}{11}$	$\frac{6}{60}$	$\frac{5}{40}$
10 $\frac{11}{11}$ 112	$\frac{100}{100}$	
11 11		
12 0		
10/23 4		
20	2 6 4 3/4	Ans
3		
20		
164 68		
60		
12		
118 11		
110		
84		
132 3 1/2		

19 Sold a yard of cloth for 11s 6d. by which was gained at the rate of 15 per cent. but if it had been sold for 12s what would have been the gain per cent?
Ans 20%

$$\begin{array}{r} 15 \\ 100 \\ \hline 115 : 100 :: 11.6 \\ 12 \\ \hline 1380 \end{array}$$

$$\begin{array}{r} 1380 \\ 1380 \\ \hline 1380 \end{array}$$

$$\begin{array}{r} 10 : \frac{12}{2} :: 100 \\ 20 \\ \hline 2000 \\ 40 \overline{) 4000} \\ 20 \overline{) 400} \\ 20 \end{array}$$

20 If when cloth is sold at 7s. a yard the gain is 10l. 6s. a yard?
Ans 5l 14s 3d 3/4 lost.

$$\begin{array}{r} 10 \\ 100 \\ \hline 110 : 100 :: 7 \\ 20 \\ \hline 2200 \\ 2200 \overline{) 14000} \\ 22 \overline{) 132} \\ 8 \\ \hline 96 40 \\ 88 \\ \hline 8 = 11 \\ 22 = 11 \end{array}$$

$$\begin{array}{r} 6 \frac{11}{11} : 6 \frac{11}{11} :: 100 \\ 12 \\ \hline 76 \\ 11 \\ \hline 840 \end{array}$$

$$\begin{array}{r} 20 \\ 2000 \\ 12 \\ \hline 24000 \\ 11 \\ \hline 264000 \\ 118 \\ \hline 2112000 \\ 1056000 \\ \hline 8410 \overline{) 1267200} \\ 84 \\ \hline 427 \\ 420 \\ \hline 720 \\ 672 \\ \hline 480 \\ 420 \\ \hline 60 = 5 \\ 12 \overline{) 84} = 7 \end{array}$$

21 At 10d per shilling profit it how much percent?
Ans 12l 10s

$$\begin{array}{r} 1 : 10 :: 100 \\ 20 \\ \hline 2000 \\ 11 \overline{) 2000} \\ 12 \overline{) 3000} \\ 20 \overline{) 250} \\ 12 = 10 \end{array}$$

22 At 3s 6d. in the pound profit how much percent?
Ans 17l 10s

$$\begin{array}{r} 1 : 3.6 :: 100 \\ 12 \\ \hline 4200 \\ 12 \overline{) 4200} \\ 20 \overline{) 350} \\ 17 = 10 \end{array}$$

23 If by selling 1 lb. of pepper for 10d there is 2d. lost, how much is the loss per cent?
Ans 16l

$$\begin{array}{r} 12 \frac{1}{2} : 2 :: 100 \\ 50 \\ \hline 2000 \\ 12 \\ \hline 24000 \\ 4 \\ \hline 96000 \\ 5 \overline{) 192000} \\ 12 \overline{) 3840} \\ 20 \overline{) 320} \\ 16 \end{array}$$

211 A merchant received from Lisbon 180 casks of raisins which stand him here in 16s each; and by selling them at 28s per Cwt he gains 25 per cent required the weight of each cask one with another? Ans 80 lb.

$$\begin{array}{r}
 \text{casks} \\
 180 \\
 16 \\
 \hline
 1080 \\
 180 \\
 \hline
 20)2880 \\
 1440 \\
 \hline
 1440 \\
 25 \\
 \hline
 720 \\
 288 \\
 \hline
 3600 \\
 \text{Interest } 288 \\
 \hline
 3600
 \end{array}$$

$$\begin{array}{r}
 \text{L} \\
 144 \\
 36 \\
 \hline
 180
 \end{array}$$

$$\begin{array}{r}
 \text{L} \\
 28:1:180 \\
 28)3600 \\
 28 \\
 \hline
 80 \\
 240 \\
 224 \\
 \hline
 16 \\
 4 \\
 \hline
 164 \\
 56 \\
 \hline
 28 \\
 224 \\
 \hline
 224
 \end{array}$$

$$\begin{array}{r}
 \text{Cwt of lb} \\
 128-2-8 \\
 4 \\
 \hline
 514 \\
 28 \\
 \hline
 4120 \\
 1028 \\
 \hline
 14400 \\
 14400 \\
 \hline
 0
 \end{array}$$

80 lb Ans

Fellowship 1823

11 put in stock 1800 dols B advanced 11 months after required the sum he put in so as at the years end to claim equal profits with A? Ans 2700 dols

$$\begin{array}{r}
 m \\
 12 \\
 11 \\
 \hline
 8:1800::12 \\
 8)21600 \\
 \hline
 \text{ans } 2700
 \end{array}$$

5 A. B. and C join stocks for 12 months; A puts in 100l and the first of the fifth month 150l more and on the first of the ninth month takes out 30l B puts in 250l on the first of the sixth month 60l more and on the first of the eleventh month 100l more C puts in 300l on the first of the fourth month takes out 200l and on the first of the eighth month takes out 50l more the whole gain is 133l what is each of it? Ans A must have 40l 12s 6d B 27l 13s 5d C 27l 13s 5d

$$\begin{array}{r} \text{£} \\ 100 \\ 12 \\ \hline 1200 \\ 1200 = 150 \times 8 \\ \hline 2400 \\ 120 \quad 30 \times 4 \\ \hline A \quad 2280 \\ 3620 \\ 1550 \end{array}$$

$$\begin{array}{r} \text{£} \\ 250 \\ 12 \\ \hline 3000 \\ 420 \quad 60 \times 7 \\ 200 \quad 100 \times 2 \\ \hline B \quad 3620 \end{array}$$

$$\begin{array}{r} \text{£} \\ 300 \\ 12 \\ \hline 3600 \\ 1800 \quad 200 \times 9 \\ 250 \quad 50 \times 5 \\ \hline C \quad 1550 \end{array}$$

$$As \quad 7450 : 133 :: 2280$$

$$\begin{array}{r} 133 \\ \cdot 6840 \\ \hline 6840 \\ 2280 \\ 7450 \overline{) 303240} \\ \underline{2980} \\ 5240 \\ 110480 \quad 148 \\ \underline{745} \\ 3030 \\ 2980 \\ \hline 50 \\ 6000 \quad 10 \\ \hline 12400 \quad 3 \end{array}$$

$$\text{£} \quad \text{s} \quad \text{d} \\ 110 \quad 11 \quad 03 \frac{1}{4} \quad Ans$$

6 A, B, and C made a stock for 12 months; A put in at first 364l. and four months after he put in 110l. more; B put in at first 1108l. and at the end of 7 months he took out 86l. C put in at first 1118l. and three months after he put in 86l. and 5 months after that he put in 100l. more; and at the end of 12 months their gain is found to be 1436l. what is each man's share thereof? Ans A 556l. 3s 6d $\frac{1}{2}$. B 529l. 16s 9d $\frac{1}{4}$. C 349l. 19s 8d.

$$\begin{array}{r} \text{£} \\ 364 \\ 12 \\ \hline 4368 \\ 320 \quad 110 \times 8 \\ \hline A \quad 4688 \\ 4466 \\ 2950 \\ 12104 : 1436 :: 4688 \end{array}$$

$$\begin{array}{r} \text{£} \\ 1108 \\ 12 \\ \hline 13296 \\ 430 \quad 86 \times 5 \\ \hline B \quad 4466 \end{array}$$

$$\begin{array}{r} \text{£} \\ 1118 \\ 12 \\ \hline 13416 \\ 1776 \quad 86 \times 9 \\ 400 \quad 100 \times 11 \\ \hline 2950 \end{array}$$

$$\begin{array}{r} 12104 \overline{) 6731968} \\ \underline{60520} \\ 67996 \\ \underline{60520} \\ 74768 \\ \underline{72624} \\ 2144 \\ 142880 \quad 3 \text{ s} \\ \underline{36312} \\ 6568 \\ 12 \\ \hline 78816 \quad 6 \text{ d} \\ \underline{72624} \\ 6192 \\ \hline 1211768 \quad 2 \text{ s} \end{array}$$

7. A, B, and C join in company; A's stock is 50 l. for 12 months, B's 160 yards of cloth 8 months, and C's 240 bushels of wheat 4 months; their gain is such, that A and B's share is 456 l. B and C's 431 l. C and A's 375 l. - Required the whole gain; each one's respectively; the price of B's cloth per yard, and what C's wheat was per bushel? A's whole gain 631 l. A's share 200 l. B's 256 l. and C's 175 l. B's cloth 12 s. per yard and C's wheat 6 s. 3 d. per bushel.

$$\begin{array}{r}
 \text{A \& B } \{ 456 \\
 \text{B \& C } \{ 431 \\
 \text{C \& A } \{ 375 \\
 \hline
 2) 1262 \\
 \hline
 631
 \end{array}$$

Months 50 months 631

$$\begin{array}{r}
 12 \div 600 = 50 \text{ A's } \{ \\
 8 \div 768 = 96 \text{ B's } \{ \text{Stock} \\
 4 \div 525 = 75 \text{ C's } \{ \\
 \hline
 1893 : 631 :: 600
 \end{array}$$

$$\begin{array}{r}
 1893 : 631 :: 600 \\
 \hline
 378600 \quad 200 \text{ A Share} \\
 378600 \\
 \hline
 00
 \end{array}$$

$$1893 : 631 :: 768 = 256 \text{ B Share}$$

$$1893 : 631 :: 525 = 175 \text{ C Share}$$

Yards 160) 96 B Stock L S S Ans

$$\begin{array}{r}
 160 \times 96 = 15360 \\
 15360 \div 128 = 120 \text{ Ans}
 \end{array}$$

Bushels 240) 75 C Stock L S S Ans

$$\begin{array}{r}
 240 \times 75 = 18000 \\
 18000 \div 100 = 180 \text{ Ans}
 \end{array}$$

Exchange.

2 What is the value of a bill of 750 l. Pennsylvania or or the like currency, in New York or North Carolina currency? Ans 800 l.
 $\begin{array}{r} \$ \quad D \quad S \quad C \\ 7-6: 8 :: 750: 800 \text{ Ans} \end{array}$

3 what sum of New York currency is equal to 173 l 16 s. in New Jersey? Ans 185 l 7 s. 8 d. 3/4
 $\begin{array}{r} \$ \quad D \quad S \quad C \\ 7-6: 8 :: 173-16 \end{array}$

4 Exchange for 375 l. Pennsylvania currency. Thirty days after sight pay to Charles Jackson or order three hundred seventy-five pounds Pennsylvania currency as per advice from the friend Peter Simpson to Benjamin Brown Merchant Virginia.

How much Virginia currency will discharge the above bill Ans 300 l
 $\begin{array}{r} \$ \quad D \quad S \quad C \\ 7-6: 6 :: 375 \\ 20 \\ 7500 \\ 96000 \\ 90540000 \\ 206000 \text{ Ans} \\ 300 \end{array}$

5 B. of Massachusetts received in Pennsylvania currency the following sums viz 76 l 17 s 8 d - 200 l - and 170 l 10 s 11 d what sum is equal thereto in the state he resides in? Ans 357 l 18 s 10 d 1/2.
 $\begin{array}{r} \$ \quad D \quad S \quad C \\ 76-17-8 \\ 200 \\ 170-10-11 \\ 7-6: 6 :: 447-8-7 \end{array}$

6 How much South Carol in currency is equal to 1500 l of New Jersey? Ans 933 l 6 s 8 d.
 $\begin{array}{r} \$ \quad D \quad S \quad C \\ 7-6: 11-8 :: 1500 \end{array}$

7 A merchant in New York owes 240 l to a planter in Virginia; how much ought he to be charged with in the planter's books Ans 180 l.
 $\begin{array}{r} \$ \quad D \quad S \quad C \\ 8: 6 :: 240 \end{array}$

8 Exchange for 562 l 13 s 9 d.

Twelve days after sight please to pay to David Davis or order five hundred and sixty-two pounds thirteen shillings and eight pence value received; and place the same to account as per advice from the friend Isaac Jones.

To Bradshaw Watson, what sum Georgia currency will discharge this bill. Ans 398 l 11 s 7 d 1/2
 $\begin{array}{r} \$ \quad D \quad S \quad C \\ 8: 11-8 :: 562-13-9 \end{array}$

9 C of Connecticut draws on D of Delaware for 104 l 16 s 9 d. what sum in the latter currency will pay this draught? Ans 131 l 0 s 11 d 1/4
 $\begin{array}{r} \$ \quad D \quad S \quad C \\ 6: 7-6 :: 104-16-9 \end{array}$

10 What sum New-York currency is equal to 180 l in Massachusetts? Ans 240 l.
 $\begin{array}{r} \$ \quad D \quad S \quad C \\ 6: 8 :: 180 \end{array}$

11 How much South Carolina currency is equal to 360 l. Massachusetts money
 Ans 280 l. $\begin{smallmatrix} L & S & D \\ 6: 11-8:: 360 \end{smallmatrix}$

Case 2

3 Jamaica is indebted to London on 1470 l 12 s 8 d. sterling with how much currency will London be credited at Jamaica when the exchange is at 36 1/2 per cent? $\begin{smallmatrix} L & S & D \\ 2007-8-23/4 \end{smallmatrix}$

25	1470-12-8
10	367 13 2
1	147 1 3
1/2	14 14 1 1/4
	7 7 0 1/2

2007-8-23/4 Ans

12 A Bill of exchange for 475 l. being remitted from Georgia to New-jersey; what is the value of it in Jersey currency? Ans

763 l 7 s 10 d 1/4 $\begin{smallmatrix} L & S & D \\ 4-8: 7-6:: 475 \end{smallmatrix}$

4 Dublin draws upon London for 740 l 14 s 6 d. Irish exchange at 12 per cent. how much sterling will discharge this bill? $\begin{smallmatrix} L & S & D \\ 752-8-3/4 \end{smallmatrix}$

112: 100:: 740-14-6

13 If 472 l 16 s 8 d. be transmitted from Georgia to North Carolina; what sum is it equal to in the latter state

Ans 810 l 11 s 5 d 1/4 $\begin{smallmatrix} L & S & D \\ 4-8: 8:: 472-16-8 \end{smallmatrix}$

14 How much Virginia currency will purchase a bill for 280 l. South Carolina currency? Ans 360 l. $\begin{smallmatrix} L & S & D \\ 4-8: 6:: 280 \end{smallmatrix}$

5 London remits to Ireland 651 l 14 s 11 d 3/4 sterling? how much Irish must London be credited exchange at 12 per cent? Ans 729 l 19 s 2 d

100: 112:: 651-14-11 3/4

20	20
2000	1303 1/2
12	12
24000	15641 9/4
4	4
96000	62567 9/4
	112
	1251358
	625679
	625679
	70076048
	6720004
	287604
	192000
	956048
	864000
	92048
	20
	11840960

15 What is 96 l 16 s 9 d 3/4 of Charleston, South Carolina worth in New-york? Ans 166 l 0 s 3 d 3/4 $\begin{smallmatrix} L & S & D \\ 4-8: 8:: 96-16-9 3/4 \end{smallmatrix}$

16 Reduce 36791 l 14 s 4 d. of New-york to New-jersey currency. Ans 34492 l 4 s 8 d 1/4 $\begin{smallmatrix} L & S & D \\ 8: 7-6:: 36791-14-4 \end{smallmatrix}$

729-19-2

6 Exchange for 452 l 10 s 6 d. ster-
ling Thirty days after sight of this
my first of exchange second and
third of like tenor and date not
paid pay to Samuel Sims or ord-
er for hundred fifty-two pounds
ten shillings and six pence ster-
ling value received; and place
the same to account as per ad-
vice from Peter Simpson

Samuel Pimm, Merchant, London
What is the value of this bill in
Pennsylvania currency exch-
ange at 77 1/2 per cent? Ans

$$80348 \text{ 1/2} \quad 77 \cdot 10 \quad \text{L } \$ \text{ D}$$

$$100 : 177 \cdot 10 :: 452 \cdot 10 \cdot 6$$

7 In a settlement between 6
of Philadelphia and 2 of Lon-
don 6 is indebted 750 l 2 s 1/2
sterling; what sum Pennsylva-
nia currency is equivalent
exchange at 78 per cent? Ans

$$1335 \text{ 1/2} \quad 78 \quad \text{L } \$ \text{ D}$$

$$100 : 178 :: 750 \cdot 2 \cdot 1/2$$

8 How much sterling is equal to
1341 l 9 s 1/2 Pennsylvania cur-
rency exchange at 67 1/2 per cent?
Ans 800 l 17 s 6 d 1/2

$$67 \cdot 10 \quad \text{L } \$ \text{ D}$$

$$100 : 167 \cdot 10 :: 1341 \cdot 9 \cdot 1/2$$

9 What sum sterling will be eq-
ual to 260 l 8 s 6 d. Virginia cur-
rency exchange at 44 per cent?
Ans 180 l 17 s.

$$44 \quad \text{L } \$ \text{ D}$$

$$100 : 144 :: 260 \cdot 8 \cdot 6$$

10 Purchased in Ireland
effects to the value of 1100
17 s 9 d. of that place; what
sum, Pennsylvania cur-
rency will discharge the
debt exchange at 51 1/2 per
cent? Ans 607 l 6 s 10 d 1/2

$$51 \cdot 10 \quad \text{L } \$ \text{ D}$$

$$100 : 151 \cdot 10 :: 1100 \cdot 17 \cdot 9$$

11 Exchange for 4776 livres
12 sols 8 deniers. Thirty days
after sight of this my second
of exchange first of the
same tenor and date not paid, pay
to Thomas Brooke or order four
thousand two hundred and two
hundred six livres twelve sols and
eight deniers value received

; and place the same to
account, as per advice from
Silas Stroud To Thomas
Lamott Merchant London

How much sterling is the
above bill at 100 1/2 per livre?
and what sum in Pennsylva-
nia currency, at 170 1/2 per
livre? L \$ D

$$184 \cdot 18 \quad 3/4 \text{ Sterling}$$

$$308 \quad 3 \quad 10 \text{ currency}$$

$$1 : 10 1/2 :: 11226 \cdot 12 \cdot 8$$

$$20 \quad 4 \quad 20$$

$$2 \cdot 12 \cdot 42 \quad 84532$$

$$240 \quad 1014392$$

$$2028784 \quad (11)$$

$$4057568$$

$$240 \quad 42604464 \quad 177518$$

$$240 \quad 1860 \quad 1244379 \cdot 1/2$$

$$1680 \quad 203698 \cdot 3$$

$$1804 \quad 184 \cdot 18 \cdot 3/4$$

$$1680$$

Ans

12 A Connecticut merchant imported goods ~~from~~ from France amounting per invoice to 49008 livres; how much currency of that state at 15d per livre, will they amount to: and how much sterling will discharge the debt exchange being at par?

Ans $\begin{matrix} 3063 & 0 & 0 & \text{currency} \\ 2297 & 5 & 0 & \text{Sterling} \end{matrix}$

Livers $\begin{matrix} 15 \\ 15 \end{matrix} :: 49008$

$\begin{matrix} 245040 \\ 49008 \\ 12 \end{matrix} \overline{) 735120}$

$\begin{matrix} 8 & 2 & 9 & 6 & 1 & 2 & 6 & 0 \\ 1 & 4 & : & 1 & : & 3 & 0 & 6 & 3 & 0 & 0 & \text{currency} \\ 12 & 16 \end{matrix}$

$\begin{matrix} 61260 \\ 12 \\ 16 \end{matrix} \overline{) 735120}$

$\begin{matrix} 20 & 4 & 5 & 9 & 4 & 5 \\ 2 & 2 & 9 & 7 & 5 & \text{Sterling} \end{matrix}$

13 A merchant in Holland being desirous to turn 4376 florins currency into lanco, the ag is at 4 per cent. how many pounds Flemish lanco must he receive? Ans 701 l. 1 fl. 13 sti. 13 pen.

$104 : 100 :: 4376$ $\begin{matrix} 6 & \text{flors} & 8 & \text{D} \\ 100 & 437600 \\ 116 & 42071313 \\ 216 & 70111313 \\ 208 & \text{Ans} \end{matrix}$

$\begin{matrix} 800 \\ 128 \\ 72 \\ 120 \\ 144013 \\ 104 \\ 400 \\ 312 \\ 88 \\ 528 \\ 88 \\ 140813 \\ 1352 \end{matrix}$

14 B. of Philade Philadelphia receives of A of Amsterdam an invoice of goods amounting to 10235 flo. 14 sti. 8 pen. how much pennsylvania currency must be remitted to discharge the bill at 35d per florin? And what is the sum in sterling exchange at 3886d.

flemish per £ sterling?

Ans $\begin{matrix} 1503 & 7 & 10\frac{1}{2} & \text{currency} \\ 886 & 4 & 5\frac{1}{2} & \text{Sterling} \end{matrix}$

$\begin{matrix} \text{flo} & \text{D} & \text{flo} & \text{sti} & \text{pen} \\ 1 & : & 35\frac{1}{4} & : & 10235 & 14 & 8 \\ 20 & & & & 20 \\ 20 & & & & 16 \\ 16 & & & & 111 \\ 120 & & & & 204717 \\ 20 & & & & 16 \\ 320 & & & & 1228310 \\ & & & & 204717 \\ & & & & 3275480 \\ & & & & 111 \\ & & & & 3275480 \\ & & & & 13101920 \\ & & & & 3275480 \\ 320 & 46 & 18 & 42 & 6 & 8 & 0 \\ & 32 & & & & & \\ & 111 & & & & & \\ & 128 & & & & & \\ & 138 & & & & & \\ & 128 & & & & & \\ & 104 & & & & & \\ & 96 & & & & & \\ & 82 & & & & & \\ & 64 & & & & & \\ & 186 & & & & & \\ & 160 & & & & & \\ & 268 & & & & & \\ & 256 & & & & & \end{matrix}$

$\begin{matrix} 1443258 \\ 36081412 \\ 203006710 \\ 1503710\frac{1}{2} & \text{currency} \end{matrix}$

$\begin{matrix} 33 & 6 & : & 1 & : & 10235 & 14 & 8 \\ 12 & & & & & & & \\ 462 & & & & & & & \\ 3696 & & & & & & & \end{matrix}$

$\begin{matrix} 204717 \\ 16 \\ 1228310 \\ 204717 \\ 3275480 \\ 29568 \\ 31868 \\ 29568 \\ 23000 \\ 22176 \\ 824 \\ 20 \\ 16480 \\ 14784 \\ 1696 \\ 12 \\ 20352 \\ 18480 \\ 1872 \\ 1488 \\ 1392 \end{matrix}$

$\begin{matrix} 116480 \\ 14784 \\ 1696 \\ 12 \\ 20352 \\ 18480 \\ 1872 \\ 1488 \\ 1392 \end{matrix}$

15 A bill for 2524 pesos. 7 via
33 marv being remitted to Cadix;
what sum Pennsylvania cur-
rency is equal thereto at 456d.

per peso? Ans 946 17 5 1/2
pero S D pesos via marv
1 : 7-6 :: 2524-7-33
8 12
34 90 20199
272 34
80799
60600 (12)
6867990
272) 61811910 227249 1/2
(20) 18937-5 1/2
946-17-5 1/2
Ans

16 A Virginia merchant sent
goods to ~~South~~ Norway worth
1743 168 Virginia currency: how
many rise dollars at 68 each must
he receive? Ans 5812 dols. U.S.

S rise dol L
6 : 1 :: 1743-16
20
6) 34876
5812-4 Ans

17 A merchant of North Carolina
shipped a quantity of flour which when
disposed of amounted to 1186 millnears
500 reas; and received in return 17
pipes of wine; what was it per pipe a
millneare reckoned at 456d. Ans 26L

385d 1/4 millneare S D mill reas
1 : 7-6 :: 1186-500
1000 12 1000
1000 90 1186500
12) 106785000
20) 8898-9
Pipes 17) 444-18-9
34 (26L
104
102
20
17) 58 (35
51
72
17) 93 (51
85
32 1/4

18 In 2711 guilders 15 stiv-
ers, how many pounds ster-
ling; exchange at 3586d fl
emish per L. sterling?

Ans 254L 188 10 1/2
S D L quil Sti
35-6 : 1 :: 2711-15
12 20
426 54295
108590 (254L
852
2339
2130
2090
1704
386
20
7720 (188
426
3460
3408
52
562 1/2

19 In 290L 118 10d sterling
how many pounds flemish
exchange at 338 10d flemish
per L. sterling and agio at 11 1/2
percent Ans 513L 148 10d.

L S D L S D
1 : 33-10 :: 290-11-10
20 12 20
20 406 5811
12 12
240 69742
406
418452 (12)
2789680
240) 28875252 (117980
240
431
9831-8
491-11-8
1966-6-8
245-15-10
L S D L S D
491-11-8 22) 12-2-6
22 2 5 20
513-14-1 ans 5710